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Surgery of the Abdominal Aorta: Technic and Pitfalls

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THIS paper discusses thromboendarterectomy and resection of the aorta and its bifurcation, with replacement by an aortic homograft or a plastic prosthesis as applied in cases of Leriche's syndrome and aortic abdominal aneurysm. Emphasis is placed on operative technic and its attendant pitfalls.

The senior author's active interest in the surgical treatment of the abdominal aorta dates back to 1948, when a 49-year-old Negro with a large abdominal aortic aneurysm was admitted to the peripheral vascular disease service of Norfolk General Hospital. Two methods of treatment were in vogue at the time: (1) wiring and electrothermic coagulation, and (2) cellophane wrapping. Impressed with the principle of cellophane wrapping and reasoning that a "cutis graft" would do as well or better, the senior author wrapped this aortic aneurysm with a "cutis graft." Two cases of aneurysm so treated were the subject of a paper published in 1950, entitled "Aneurysm of the Abdominal Aorta: Report of Two Cases Treated by Cutis Grafting."[1] Similar treatment was employed in 3 additional cases shortly thereafter.

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The results of "cutis grafting" of abdominal aortic aneurysms were most encouraging. The method seemed to reinforce effectively the weakened aneurysmal sac and to delay the calamity that usually awaits the patient, i.e., rupture of the sac followed by death. The aneurysms became less pulsatile, firmer and smaller. The patients' symptoms were alleviated. The first patient died, approximately four months after the operation, the evident cause of death being a posterior rupture of the aneurysm where it was uncovered by cutis. The second patient was markedly improved and rehabilitated after "cutis grafting" and remained in good health until he died of a cerebral accident three years later. The third patient was initially improved, but the aneurysmal sac began to dilate about two years after the operation. The aneurysm was resected and a homograft inserted. One patient was lost to follow-up. The last in a series of 5 is living and well at the time of writing, two years after "cutis grafting" of his aneurysm.

When Oudot[2] first described resection of the abdominal aorta and its replacement with a homograft for thrombotic occlusion and Dubost[3] first used a graft for reconstruction after excision of an abdominal aortic aneurysm, we were quick to realize that a rational approach to surgical treatment of the abdominal aorta had been devised.

Although our experience in operating on the abdominal aorta and its bifurcation has not been numerically large, it has been illuminating, and we hope that presentation of some of the problems we encountered and the mistakes we made will aid those who are embarking on work in this new field. The accompanying table summarizes our experience in 14 cases of thrombosis or aneurysm of the abdominal aorta treated surgically.

In some of the early cases operation was attempted when there were obvious signs of ischemia in the extremity, due to peripheral arteriosclerosis obliterans. Poor results were to be expected.

The patients in cases 6 and 7 of Leriche's syndrome, treated by thromboendarterectomy and kept on anticoagulant therapy have been remarkably well. The 1 patient who underwent aortic resection and homografting for Leriche's syndrome was back at work until a cerebral accident occurred, six months after the operation. Two patients with large fusiform arteriosclerotic aortic aneurysms treated by resection and aortic homografting have remained in excellent health. Both patients with ruptured aortic abdominal aneurysm were lost.

The technic to be described has evolved from a limited personal experience and a careful study of the contributions of Oudot,[2] Dubost,[3] DeBakey, Cooley and Creech,[4] Bahnson,[5] Julian and his coworkers,[6] Freeman and his associates,[7] Wylie and Gardener[8] and Blakemore and his collaborators.[9]

Technic.—Preoperative Care: We are dealing with patients in the old age group who are to undergo major operations. The cooperation of an internist is necessary to evaluate the cardiac status and general health of the patient. The preoperative work-up includes an electrocardiogram, a roentgenogram of the chest, renal function tests and determination of the values for blood nonprotein nitrogen, sugar and cholesterol. Oscillometric readings should be taken of the extremities and the status of the extremity pulses noted. The patient must go to operation prepared for a long and shocking procedure. Malnutrition and chronic preoperative shock should be presumed to exist. Blood transfusions, parenteral vitamin therapy and a high protein diet for several days prior to operation are in order. When the aneurysm has already ruptured a surgical emergency certainly exists, but an effort should be made to re-

store the patient's blood volume and to bring him into the best possible shape before rushing him to the operating room. Wangensteen suction for twenty-four hours prior to the operation will facilitate packing off the small bowel. Seven pints of blood should be available for the operating procedure. Preoperative sedation should be mild, as these patients tolerate narcotics poorly. The need of bedside oxygen and a special nurse for the patient's return to his room should be anticipated.

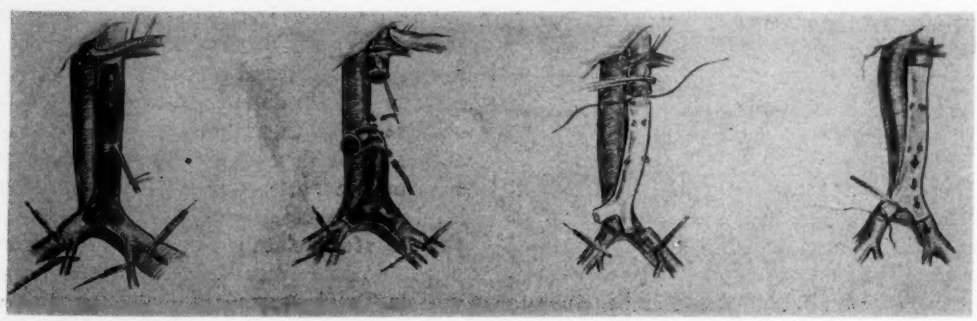
Anesthesia: Intratracheal anesthesia is administered by an anesthesiologist especially trained for the purpose. Two veins are cannulated, one for the rapid administration of blood under pressure. We have had a limited experience with hypotensive anesthesia with the drug arfonad. The blood pressure is dropped as the aorta is cross-clamped. This seems to lessen the tendency of the occlusive clamp to fracture the fragile aortic wall. There has been some difficulty in getting the patient to breathe "on his own" after the use of arfonad, but its use has seemed worth while. The hypotensive effect is limited to a short interval, as it is important that the blood pressure be up when the aortic clamp is removed and at the close of the operating procedure. One wishes a vigorous flow of blood to pass through the graft. Furthermore, one wishes to detect any areas of bleeding temporarily obscured while the aorta is cross-clamped and while the patient is in the hypotensive state.

If a lumbar sympathectomy has not been performed previously and is planned for the present operation, kidney rests are placed on either side of the lumbar region so that the table can be tilted to facilitate the sympathectomy.

Incision: We prefer a transperitoneal approach. A left paramedian incision is made from the xyphoid to the pubis. As in most instances, the larger the incision the better the exposure, and this is true especially in aortic surgical procedures.

Exploration: A complete exploration of the abdominal contents is carried out as soon as the abdomen is opened, to discover or eliminate other abdominal pathologic conditions. In Case 2 a gallbladder filled with stones was noted, and a cholecystectomy was carried out in addition to the aortectomy and homograft.

Exposure: The small intestine is packed off to the right, the transverse colon superiorly and the sigmoid colon to the left. Numerous lap pads are necessary, and special attention should be paid to the cecum, the descending colon and the sigmoid colon. Deaver retractors are most efficient



1. 2. 3. 4.

Fig. 1.—Aortectomy and homograft for thrombosis of aorta. *1*, thrombosed area of aorta; *2*, aorta sectioned above; thromboendarterectomy of the short occluded upper aortic cuff; *3*, aorta resected and homograft inserted; *4*, aortic and left iliac anastomoses completed and blood allowed to flow while right iliac anastomosis is begun.

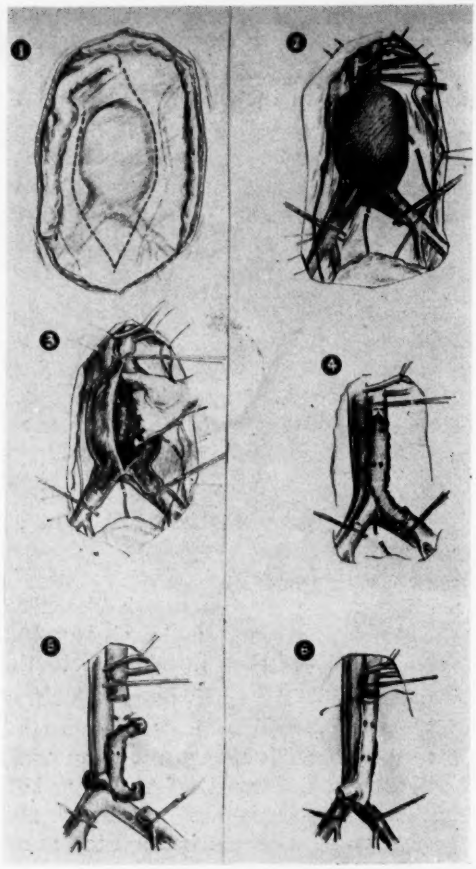


Fig. 2.—Aneurysmectomy and homograft. *1*, incision of posterior peritoneum to either side of the aneurysm; *2*, aorta cross-clamped above and iliac arteries below; inferior mesenteric artery ligated and divided; *3*, anterior aspect of aneurysm incised and clotted contents evacuated; *4*, anterior and lateral walls of aneurysmal sac excised; *5*, aorta sectioned above and iliacs below; most of posterior wall dissected from vena cava and excised; *6*, homograft inserted and anastomoses begun.

in maintaining the lap pads in place. Additional surgical assistants help considerably. The time taken for good exposure of the posterior peritoneum pays big dividends. When it has been impossible to pack off the small bowel and the abdominal cavity, we have resorted to the maneuver of the late Frank Lahey, exteriorizing the intestines in a Davol rubber intestinal bag.

Attention is now turned toward the aneurysm or the thrombotic aorta. A decision should not be made at this point against resection on the basis of extensive pathologic change or extension of the lesion to the renal vessel level; for, in almost every incidence, by maneuvers to be described, such as downward traction of the aneurysm, upper traction on the left renal vein, freeing of the short aortic cuff above the lesion from the prevertebral fascia or thromboendarterectomy of the short aortic cuff, sufficient stump can be secured for cross-clamping of the aorta.

Incision of the Posterior Peritoneum: This begins in the midline of the pelvic cavity, below the aortic bifurcation. In the presence of aortic thrombosis it extends upward just to the left of the aorta, to and through the ligament of Treitz. One can usually dissect the peritoneum freely on either side, avoiding the ureter on the left and hugging the root of the mesentery on the right. In aneurysmectomy no attempt is made to free the peritoneum from the anterior wall of the aneurysm. The incision of the posterior peritoneum in these cases consists of two limbs. The left limb hugs the border of the aneurysm; the right limb ascends from the pelvis along the right side of the aneurysm to the root of the mesentery, just under the duodenum.

The Upper Dissection: The upper dissection has three purposes: first, to expose the aorta below and above the renal vessels; second, to determine whether the lesion is resectable, and third, to gain control of the aortic flow above the lesion. Exposure of the aorta above the renal vessel level may be life-saving. In 1 of our cases the Craaford clamp caused a slight rent in the aorta immediately below the renal vessels. Temporary placement of the clamp above the renal vessels permitted suture of this rent and saved the situation. The occlusive clamp above the renal vessel was in place almost half an hour, but the pa-

tient had a relatively uneventful convalescence. Postoperatively the nonprotein nitrogen level rose considerably, but was reduced by intensive medical treatment.

Exposure of the aorta at the renal level is facilitated by free division of the ligament of Treitz, a centimeter or more of peritoneal border being left for future closure of the posterior peritoneum. By reflection of the jejunum and the third portion of the duodenum upward and to the right, the root of the mesentery and the superior mesentery vessels are pushed to the right out of the field.

Freeing the duodenum is a delicate step. In 1 of our cases, in which a "cutis graft" had been done previously, the duodenum was so adherent to the aneurysm that it was torn twice during its dissection. As soon as possible, blunt dissection is begun on the proximal aorta in the correct cleavage plane, directly on the aortic wall. This is best begun to the left of the aorta or over the anterior wall of the aorta, just above the upper limit of the lesion. Careful attention is necessary, during this procedure, to avoid injuring the left renal vein as it crosses the aorta. It is obscured by a layer of fat and fibrous tissue. The renal vein may be freed from the underlying aorta and pulled upward with a traction tape. In Case 13 the renal vein was torn by a Deavor retractor, and considerable time was lost in suturing the rent. As the

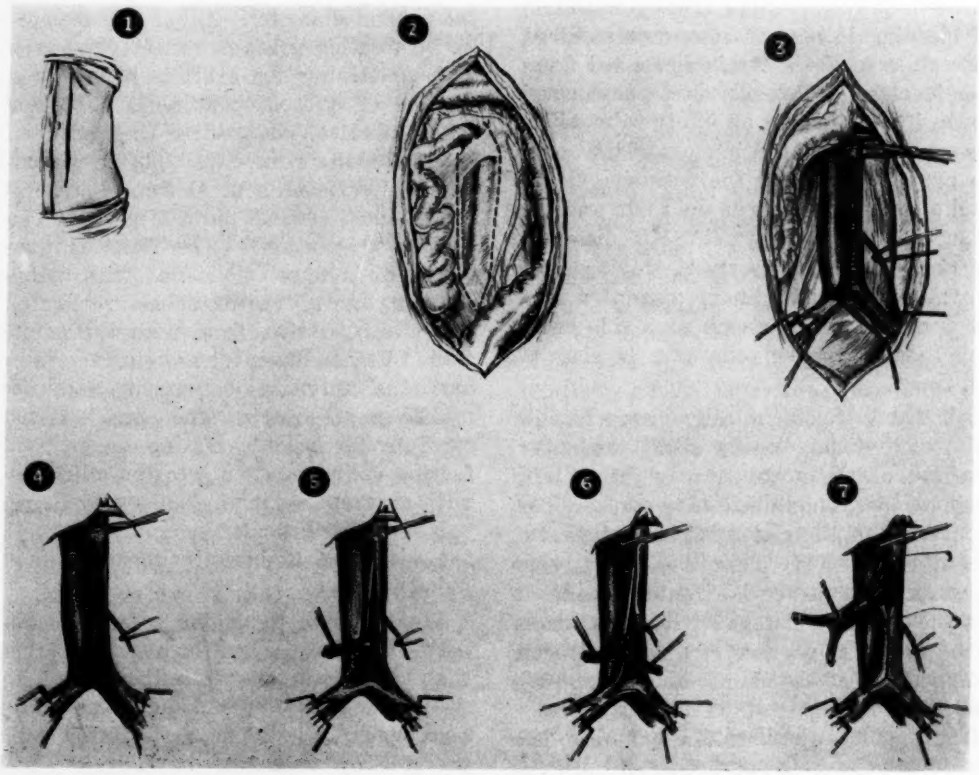


Fig. 3.—Thromboendarterectomy for thrombosis of the aorta. *1*, skin incision; *2*, exposure and incision through posterior peritoneum; *3*, clamps placed to control blood flow; *4*, incision through anterior wall of aorta; *5*, thromboendarterectomy; *6*, suture of anterior aortic wall.

dissection continues to the right of the upper portion of the aorta, care should be taken not to injure the vena cava. Fortunately, the greatest point of separation of these two vessels is here. By using the thumb and forefinger and a pinching maneuver, it is usually now possible to separate the posterior wall of the aorta from the prevertebral fascia and finally to pass the index finger completely around the aorta. A large kidney pedicle clamp is now passed under the aorta from right to left in the narrow freed zone between the renal vessels above and the lesion below. In passing this clamp, care is taken to avoid injury to the posteriorly placed lumbar veins and arteries. An umbilical tape is pulled through and around the aorta for control of bleeding in case of emergency. Blunt dissection of the aorta is continued from the level of the renal vessel downward toward the lesion in an effort to mobilize several additional centimeters of the aorta to provide room for the occlusive clamp and a cuff for section of the aorta and the placement of a graft. A Kit dissector works well for this purpose, staying close to the aortic wall. Sharp dissection may be necessary on the vena cava side keeping the wall of the vena cava in view at all times.

A Craaford or Satinsky clamp is now placed (but not closed) about the upper portion of the aorta from right to left, just below the umbilical tape marker. The convexity of the clamp is placed cephalad so as to curve the clamp below the renal vessels. We prefer horizontal placement of the occlusive clamps. In 1 of our cases the posterior portion of the aortic cuff slipped out of the clamp, and reclamping was difficult with the vertically placed clamp against the vertebral column. The occlusive clamp is not tightened until the other steps ancillary to the resection are completed. One usually has to be satisfied with a miserably short cuff, but if a centimeter is available, resection should be considered feasible. Twice we have felt the case was inoperable only to obtain sufficient cuff for resection after further dissection.

Preparation of the Homograft: As soon as the upper dissection is completed and the decision has been reached to perform aortic resection and graft replacement, preparation of the graft is begun. It is preferable to have an additional sterile table set up for this purpose. Most of our grafts have been preserved by quick-freeze freeze-drying and arrive in the operating room in a large pyrex tube. For aneurysmectomy of the aorta a thoracic graft is selected, for it is large and is apt to have the needed diameter. Otherwise an aortic bifurcation graft is used. The pyrex tube containing the graft is placed in a solution of aqueous zephirin 1:1,000 for thirty minutes. The graft is then removed and soaked in a saline-streptomycin-penicillin solution for an hour (1 Gm. of streptomycin and 1,000,000 units of penicillin in 1 liter of solution). The graft is then placed on a towel moistened with saline solution, and all the branches are ligated with No. 000 silk, flush with the aortic wall. This usually involves tying the lumbar, the inferior mesenteric and the middle sacral arteries. The graft is tested carefully for leaks by closing one end and forcing saline solution into the other end with an aseptosyringe. Leaks may be repaired with silk mattress sutures through the adventitia or by suturing on a small nylon patch.

We continue to prefer to replace the aorta with a banked homograft rather than a cloth prosthesis, although we always have the latter on hand in case of an emergency. The homografts suture well, are readily amenable to tailoring and bend nicely into the pelvis.

The Left Lateral Dissection: In cases

of thrombosis of the aorta this presents no problem. With large aortic aneurysms, all exposure may be difficult. The dissection stays close to the aneurysmal wall until the peritoneum is freed from the left wall of the mass above and below the inferior mesenteric artery. The ureter should be early identified and retracted with an umbilical tape. Care must be taken not to injure the inferior mesenteric vein, which courses along the left border of the posterior peritoneal flap. In 1 of our cases this vessel was divided to gain exposure, and it was our subsequent conclusion that this led to mesenteric thrombosis and delayed gangrene of the sigmoid.

The inferior mesenteric artery may or may not be thrombosed. It is clamped, divided and ligated close to the aorta, so that the collateral circulation through the arcade is not interfered with. The blood supply of the sigmoid and descending colon is now dependent upon branches from the middle colic and internal iliac arteries through the middle hemorrhoidal. Should the sigmoid and descending colon show evidence of disturbed blood supply, a loop colostomy, with exteriorization of the questionable bowel, or bowel resection should be done along with the aortic procedure, or consideration should be given to anastomosing the end of the artery to the side of the new aorta. In 1 of our patients (previously referred to) the sigmoid colon appeared dark and of questionable viability. Prior to closure of the abdomen, after replacement of the aorta with a nylon prosthesis, the bowel continued to be dusky, but it was thought that it would regain complete viability. The abdomen was closed without exteriorization of the questionable portion of the sigmoid. Postoperatively the patient continued to complain of pain and tenderness in the left lower abdominal quadrant. As he had a number of stools, however, and had an afebrile course except for one spike of temperature to 102 F., reexploration was not done. The sutures were removed on the eleventh postoperative day, whereupon evisceration immediately took place. The patient was taken to the operating room. A brief exploration of the abdominal contents was made. Feces were present in the abdominal cavity. The proximal sigmoid colon was nonexistent and the descending colon gangrenous. The latter was resected and a transverse colostomy done. The distal sigmoid was brought out as a mucous fistula. The abdomen was resutured with through-and-through interrupted steel wire. The cause of the mesenteric thrombosis in this case may have well been venous, i.e., due to section of the inferior mesenteric vein — for its evolution was greatly delayed. DeBakey and his associates referred to a case of sigmoid gangrene attributed to ligation of the inferior mesenteric artery.

The Lower Dissection: The peritoneal flaps are dissected back to expose the aortic bifurcation and iliac vessels over the entire length. The ureters are reidentified on either side. Loose areolar tissue on top of the iliac arteries is divided. The dissection continues close to the arterial wall, to expose the vessels anteriorly; to either side and deep into the pelvis until relatively normal arteries are encountered. The site of the future section of the iliacs is chosen. This will depend on the existing pathologic conditions. A site just cephalad to the iliac bifurcation enables one to arterialize both external and iliac arteries with one anastomosis. The internal iliacs may be thrombosed and, if so, may be disregarded. But if they are patent and the common iliac must be sacrificed because of occlusion or dilatation, an iliac bifurcation graft should be used and a double anastomosis performed at this site, one to the external iliac artery and one to the hypogastric artery.

At least 2 cm. distal to the chosen site

Data in 14 Cases of Aneurysm of the Abdominal Portion of the Aorta, Treated Surgically

Case	*Diagnosis*	*Treatment*	*Result*	*Comment*
1	Leriche's syndrome	Aortic and iliac thromboendarterectomy	Lost one limb	Failure due to peripheral arteriosclerosis with advanced ischemia of the leg prior to operation
2	Leriche's syndrome	Bilateral lumbar sympathectomy	Unimproved	Another case of peripheral arteriosclerosis obliterans with advanced peripheral ischemia. Thromboendarterectomy was subsequently performed at Duke Hospital. Patient lost one limb and died 6 months after second operation
3	Leriche's syndrome	Bilateral lumbar sympathectomy	Symptomatically improved	Patient refuses resection of aorta and graft
4	Iliac thrombosis	Left lumbar sympathectomy, iliac and femoral thromboendarterectomy	Lost one limb	A long thromboendarterectomy failed as in hindsight was to be expected; a long graft would have been better
5	Leriche's syndrome	Bilateral high lumbar sympathectomy	Symptomatically improved	Patient living and relatively well 3 years after operation
6	Leriche's syndrome	Bilateral lumbar sympathectomy; subsequent aortic and iliac thromboendarterectomy	Marked improvement; has bilateral popliteal pulsations	At work 8 months after operation; is on perennial anticoagulant therapy
7	Leriche's syndrome	Lumbar sympathectomy; aortic and iliac thromboendarterectomy, 1 stage	Marked improvement	At work 8 months after operation; has a right dorsalis pedis pulsation and left popliteal artery pulsation; is also on perennial anticoagulant therapy
8	Leriche's syndrome	Lumbar sympathectomy; subsequent aortic resection and homograft	Marked improvement	Surgery resulted in bilateral dorsalis pedis pulsations; patient died of cerebral thrombosis 6 months after operation
9	Iliac thrombosis	Left iliac thromboendarterectomy	Marked improvement	Restoration of left dorsalis pedis pulsation; improvement maintained 6 months after operation
10	Large fusiform arteriosclerotic abdominal aorta	Resection and restoration with aortic homograft	Marked improvement	Patient at work and improved mentally and physically 9 months after operation
11	Large fusiform arteriosclerotic aneurysm of the abdominal aorta	Resection and aortic homograft	Marked improvement	Improvement maintained 8 months after operation
12	Large arteriosclerotic abdominal aneurysm; Ruptured 24 hours prior to operation	Aortic resection and nylon graft	Died 11 days after operation	Gangrene of the sigmoid and evisceration

13	Large ruptured aortic abdominal aneurysm; Ruptured 5 days prior to operation	Resection and homograft	Died immediately after operation	Patient in extremis at time of operation; died of surgical shock; left renal vein injured during operation
14	Secondary dilatation of an arterio-sclerotic aortic abdominal aneurysm; "cutis grafting" done 2 years previously	Resection and homograft	Died 48 hours after operation	Patient died of postoperative hemorrhage from the omentum

of section of the iliac artery, preparations are made for the application of an occlusive clamp. The thin fibrous tissue binding the artery and vein is divided sharply at the posterior border of the artery. The artery is raised with a smooth forceps or Babcock clamp and freed from the underlying vein. At the common iliac bifurcation level, it may be advisable to identify and divide the iliolumbar artery, which binds the vessels to the posterior structures at this site; otherwise this vessel may be torn as the iliac artery is elevated for the anastomosis. An umbilical tape is placed about the artery and then a straight Potts ductus clamp.

Freeing of the iliac arteries then proceeds cautiously. There are two steps in the lower dissection in which extreme care is necessary to prevent tearing the adjacent vein: (1) separation of the left common iliac vessels and (2) separation of the aortic bifurcation from the underlying left common iliac vein. A thorough knowledge of the vascular relations of this area is essential. The large left common iliac vein ascends mesial to the iliac artery and practically fills the aortic bifurcation space. The actual bifurcation of the vena cava is overridden and hidden by the upper portion of the right common iliac artery. The right external iliac vein is mesial to the corresponding artery deep in the pelvis. It ascends under the bifurcation of the iliac artery to attain a position lateral to the artery as it enters the vena cava. In our first resection for aortic aneurysm a large rent was made in the left iliac vein during an attempt to mobilize the corresponding artery. It required forty-five minutes and 2 additional pints of blood to get out of this complication. The bleeding was finally controlled only by passing two Figure 8 sutures around the vein wall and through the pelvic periosteum. There was some postoperative leg edema, which cleared within a few months after the operation.

The Right Lateral Dissection: This presents no special problem in cases of aortic thrombosis. In these cases the vena cava can be well visualized and the cleavage plane between it and the aorta developed sharply. With large aneurysms the vena cava is hidden from view. The right lateral dissection is deferred until the aorta is cross-clamped above and the iliac vessels cross-clamped below. Dissection of the aneurysmal wall from the vena cava is then done from below upward and from above downward, with cautious use of sharp dissection and retraction of the aneurysmal sac to the left. When the aneurysm is very large it is incised, its contents removed and most of the sac excised in order to facilitate exposure of the vena cava and its dissection.

Lumbar Sympathectomy: In our opinion, a lumbar sympathectomy is a valuable procedure in aortic surgery. It reduces peripheral vascular spasm and increases the peripheral vascular bed. If it has not been done previously, it may be performed at this stage of the operation, particularly

if the operation is being performed for aortic thrombosis. Tilting the table first to one side and then the other helps considerably. The left lumbar sympathetic chain is readily removed under direct vision. Removal of the right sympathetic chain requires displacement of the vena cava to the left. A rapid right lumbar sympathectomy through a separate muscle-splitting retroperitoneal incision at the outset of the operation might well be considered.

Regional Heparinization: All authors refer to the tendency of the blood to clot proximal and distal to the occlusive clamp on the aorta and iliac arteries. In operating for aortic thrombosis we have preferred to insert a polyethylene tube through an 18-gauge thin-walled needle into the aorta above the occlusive clamp. The plastic tube is connected to an overhead pressurized flask containing 100 mg. of heparin in 500 cc. of 5 per cent dextrose solution. This not only permits regional heparinization proximal to the occlusive clamp during the operation but provides heparinized blood that will descend the vascular system after the grafting procedure is completed and the occlusive clamps removed. A similar procedure can be used for the iliac arteries, but as a rule we simply insert the polyethylene tube into the open end of each iliac artery and inject heparin solution manually from time to time. In aneurysmectomy we follow DeBakey and Bahnson's suggestions, injecting 10 mg. of heparin into each iliac artery and into the aneurysmal sac just prior to closing the aorta with the occlusive clamp. Heparin solution may be used in another manner, as suggested by Warren; the graft may be filled with heparin solution and the solution trapped in with bulldog clamps until the anastomosis is completed and the occlusive clamps removed. We have not employed regional heparinization postoperatively as suggested by Freeman, but in cases of aortic thrombosis we have used systematic postoperative anticoagulant therapy. In fact, in 2 most successful cases the patients have now been on dicumarol as outpatients for over eight months.

The Aortic Resection for Thrombosis of the Aorta and Its Bifurcation (Fig. 1.): A check is made to be sure that as much of the preliminary work has been done as possible and that the preparation of the graft is well along. The occlusive clamps on the aorta above and the iliacs below are gradually tightened sufficiently to control blood flow. The iliac arteries are sectioned obliquely 1 to 2 cm. cephalad to the occlusive clamp, so as to provide a cuff that can be thromboendarterectomized if necessary and to increase the cross diameter of the cuff. If oblique section and thromboendarterectomy fail to provide wide cuffs the iliac vessels may be dilated with Bake's common bile duct dilators. Spasm of these vessels may be overcome by the local application of 2 per cent papaverine solution. Removal of the thrombosed iliac arteries and the aortic bifurcation is then continued from below upward. The middle sacral artery, the inferior mesenteric artery and the four paired lumbar arteries coming off the posterior wall of the aorta are clamped and divided as encountered. The aorta is sectioned above the thrombosed area, and a thromboendarterectomy is performed on the cuff if atheromatous thickening is pronounced. Should the aorta be thrombosed to the renal level, a maneuver described by DeBakey and his co-workers may be utilized. With the Craaford clamp in place below the renal arteries but not tightened, the aorta is compressed manually against the vertebral column above the renal vessel level. With the aortic blood flow thus temporarily controlled, the cuff below the renal arteries is cleared by the thromboendarterectomy technic. The Craaford clamp is then tightened and manual com-

pression removed.

Aneurysmectomy (Fig. 2): In aneurysmectomy one wishes to reduce to a minimum the time required for cross-clamping the aorta, although one and one-half or two hours may be well tolerated. Some time may be gained by resecting the left common iliac artery and performing one of the bifurcation anastomoses first. The competence of this anastomosis is tested by injecting saline solution into the graft with an asepto syringe. The Craaford aortic clamp is then slowly tightened to the first notch just below the renal vessels. We use gloves in the form of tubular shoe laces on the jaws of the clamp to help prevent tearing the friable aorta. The systolic blood pressure is lowered by use of arfonad, for a similar purpose. The right iliac clamp is tightened, and all of the occlusive clamps are fixed to the drape to prevent accidental rotation. The aorta is then sectioned below the upper occlusive clamp. If the cuff is short it is preferable to carry the section through part of the aneurysmal sac, so as to leave a cuff that can be inspected for atheromatous thickening and so as to prevent slipping of the cuff out of the occlusive clamp. It is also well in sectioning the vessel to leave the posterior wall somewhat longer than the anterior, to facilitate suturing.

The aneurysmal sac is now dissected from above downward from the prevertebral fascia posteriorly and the vena cava mesially. The lumbar arteries are divided and ligated as encountered. If the aneurysmal mass is large, obscuring the vena cava, it is simply incised widely in the longitudinal aspect and the large contained clot evacuated. As much of the sac wall as possible is then resected. The portion of the sac adherent to the vena cava is left *in situ*. The atheromatous intima of this portion may be readily peeled off. The orifices of the lumbar arteries leaving this portion of the sac are sutured over from within. Resection of the aortic bifurcation involves ligation and division of the middle sacral artery, which comes off the posterior wall of the aorta at this site and passes under the vena cava to course on the floor of the pelvis and to anastomose with the iliolumbar artery.

Preliminary Hemostasis: After resection of the aorta, sites of bleeding must be carefully sought for and controlled. A vasoconstrictor is added to the infusion to raise the blood pressure if it has not come up spontaneously with the use of blood transfusions and after discontinuing the arfonad. Rents in the vena cava are sutured within a Satinsky clamp, everting mattress sutures of No. 00000 arterial silk being used. The operative field should be entirely dry before the grafting procedure is begun.

Placement of the Graft: The left iliac anastomosis has already been completed. The defect to be grafted is measured and the graft made to a corresponding length. The tendency is always to insert too long a graft, and as a result there is considerable bowing. Generally speaking, a long aortic segment and short iliac segments are preferable, being less liable to thrombosis. Time is taken to correlate the diameter of the various cuffs to be joined. Some tailoring of the graft with sutures may be required. The ends may be beveled, dilated or plicated to facilitate fitting. A snugly fitting cuff of nylon is slipped over the homograft. It will be used to reinforce the upper suture line. A thoracic artery graft is selected if the aorta alone is to be replaced, for it provides a larger graft. Otherwise, an aortic bifurcation graft is used. The aortic cuff is retrimmed. The previously fitted graft is now sutured to the aorta with well lubricated arterial silk. The homograft is placed *in situ* with the lumbar arteries anteriorly, so that leakage from any branches is readily seen. We have used two closely applied continuous

sutures of No. 0000 braided arterial silk. The sutures are started posteriorly, one going clockwise and the other counterclockwise. The two sutures meet anteriorly and are tied. Hemostasis and exposure must be at their best, so that the sutures may be placed close together, quickly and accurately. Fine dura forceps help in placing the anastomotic sutures. Just before the last sutures are placed, the aortic occlusive clamp is momentarily loosened to permit the extrusion of clotted blood. The left iliac clamp is removed, then the aortic occlusive clamp, and the blood is allowed to flow through the graft and through the left iliac vessel to the pelvis. Possibly some blood will reach the other extremity through existing collaterals. The aorta where the Craaford clamp has been placed is checked for undue necrosis or tearing. Small tears or bleeding points at the anastomotic line are controlled with additional mattress sutures placed through the adventitia only. The anastomotic site is further reinforced by sliding the nylon cuff over the anastomosis as recommended by Dubost. If a cloth prosthesis has been used, particularly of nylon or vinyon-N, the graft will leak badly at first, looking like a sieve straining blood. Finger compression of the aorta for a minute will give the blood a chance to clot in the interstices of the cloth and produce hemostasis. This maneuver may have to be repeated several times before active bleeding ceases. If oozing continues through the prosthesis, an additional layer of nylon may be lightly wrapped around the graft. Hypotensive anesthesia may offer considerable help here.

The right iliac anastomosis is now completed, and the intraoperative regional heparinization is discontinued. Any bleeding from the lower anastomosis is readily controlled with small mattress sutures of No. 00000 silk, placed through the adventitia only; or a piece of nylon may be laid around the suture line.

Closure: The entire grafted area should be reexplored for hemostasis. This examination should include, in addition to the anastomoses and the graft, the bowel, the omentum and the mesentery. The blood pressure should be up during this exploration. One of our patients went into shock from omental bleeding postoperatively, although complete hemostasis had seemed to be present as the abdomen was closed.

The posterior abdominal wall and the great vessels are covered by resuturing the peritoneum with running No. 00 chromic catgut. The viability of the sigmoid and descending colon is rechecked. Abdominal closure is done in the usual manner with closely placed No. 00 interrupted silk for the anterior fascia and heavy retention sutures of silk or wire. These retention sutures are tied over gauze to prevent tearing of skin and muscle and to eliminate dead space.

Thromboendarterectomy for Occlusive Disease of the Aorta (Fig. 3): For classic Leriche's syndrome, surgical removal of the pathologic thrombosed aorta and replacement with a graft seems rational. The patients are relatively young, peripheral arteriosclerosis is minimal and there is a sharp demarcation of the thrombosed section of the aorta. Cases will be encountered, however, in which the segmental occlusion involves only one iliac vessel or a short segment of the aorta or in which aortic or iliac stenosis is present without actual occlusion. In such instances we prefer a lesser procedure than resection and grafting — thromboendarterectomy. We are cognizant of the fact that thromboendarterectomy used for occlusive disease of the smaller femoral artery has fallen into disrepute, but no evidence has yet been produced to show that an aorta or iliac vessel without intima is a less suitable conduit for blood and more likely to become thrombosed, disrupt or dilate than

the inert banked homografts or cloth prostheses. The aorta provides the best assurance against thrombosis — a vigorous flow of blood. In our opinion, thromboendarterectomy has a place in the surgical treatment of Leriche's syndrome, particularly for short occlusions and partially occluding or stenotic lesions. Some of the advantages of thromboendarterectomy on the aorta are:

1. It is quickly and readily performed.
2. Collateral channels, particularly the lumbar arteries, and the inferior mesenteric artery are preserved.
3. Complications incident to removal of the aorta from the vena cava and iliac veins are avoided.
4. The period of cross-clamping of the aorta is minimal. Aortic occlusion may even be accomplished by manual compression of the aorta against the vertebral column.
5. The procedure is applicable to the disease at or above the renal artery level.
6. It preserves an autogenous conduit of the blood, even though it is temporarily without intima.
7. It is applicable to partially occlusive or stenotic types of disease.

Procedure: The exposure and preliminary work are as aforedescribed for aortic resection. With occlusive clamps tightened on the iliac arteries, the thromboendarterectomy begins below. Linear incisions continue upward to meet at the bifurcation and to ascend on the aorta. The intima and enclosed thrombus are peeled out with a Smithwick dissector. The intima is cut across below through an unoccluded area of the vessel. Thromboendarterectomy is avoided peripherally. The distal cuffs may be dilated with Bake's dilators. Heparinization in the cuffs is begun as aforedescribed. Suture of the arteriotomy incisions is begun below and continued upward as the thromboendarterectomy proceeds, with a simple over-and-over continuous No. 0000 braided silk suture. As the upper end of the occlusion is reached the aortic occlusive clamp is tightened or manual compression used. The thromboendarterectomy procedure is completed to above the upper limits of the occlusion. A second continuous suture is started above and continued downward to join and be tied to the first suture. Regional heparinization in the upper aorta is discontinued. During thromboendarterectomy, bleeding from the paired lumbar arteries may be controlled by simple manual compression of the orifices of these vessels within the opened aorta. The inferior mesenteric artery is simply occluded temporarily with a bulldog clamp. Should bleeding occur from the aorta after its suture, it can usually be controlled with interrupted mattress sutures placed through the adventitia only. Small patches of nylon may also be overlaid on the suture line.

Postoperative Care.—Care is taken to avoid a postoperative drop in pressure. A slow neosynephrine drip with 5 per cent dextrose in water is continued. Additional blood is given as indicated. Gastric suction and prostigmine are used to prevent the otherwise inevitable abdominal distention from paralytic ileus. A catheter is placed in the bladder and the urinary output watched. Fluid and electrolyte balance are carefully studied. Reduced excretion of urine due to temporary lower nephron nephrosis is expected. Excess parenteral fluids are avoided. Potassium is given after diuresis begins if there is evidence of hypokalemia. Antibiotics are given to prevent infection. The patient is permitted early ambulation if at all possible.

At long last satisfactory surgical procedures are available for thrombosis and aneurysm of the abdominal aorta. Both thromboendarterectomy and resection have a place in Leriche's syndrome. Aneurysmectomy with grafting is the operation of choice for aneurysm, ruptured or un-

ruptured. Further research is necessary to develop simpler methods of sterilizing and preserving homografts. Pliable synthetic aortic prostheses such as vinyon-N, nylon or orlon may eventually be preferable to banked homografts.

SUMMARY

The authors describe in detail their technics of direct operation on the abdominal aorta. The inherent dangers are emphasized: They are: (1) slipping of the aortic occlusive clamp; (2) fracture of the aorta by the occlusive clamp; (3) injury to the duodenum; (4) injury to the left renal vein, the inferior mesenteric vein or the vena cava; (5) bleeding from the lumbar, middle sacral or iliolumbar vessels; (6) injury of the ureters; (7) clot formation above and below the occlusive clamps, and (8) hemorrhage from the anastomoses and from the graft.

Their experience with 14 cases is tabulated.

RIASSUNTO

Viene descritta in dettaglio una tecnica personale per la chirurgia dell'aorta addominale, con particolare riguardo ai pericoli relativi. Essi sono rappresentati da (1) scivolamento dell'angiostato posto sull'aorta; (2) rottura dell'aorta da parte dell'angiostato; (3) lesioni al duodeno; (4) lesioni alla vena renale di sinistra; alla vena mesenterica inferiore o alla cava; (5) emorragia dalle arterie lombari, mediosacrali o ileolombari; (6) lesione agli ureteri; (7) coagulazione al di sopra o al di sotto della zona di compressione; (8) emorragia dall'anastomosi o dal trapianto.

Vengono presentati 14 casi personali.

ZUSAMMENFASSUNG

Die Verfasser geben eine genaue Beschreibung ihrer Technik der direkten Operation an der Bauchaorta unter Hervorhebung der dem Eingriff anhaftenden Gefahren. Dazu gehören: (1) Abgleiten der die Aorta unterbindenden Klemme, (2) Riss der Aorta durch die Klemme, (3) Verletzung des Zwölffingerdarmes, (4) Verletzung der linken Nierenvene, der unteren Mesenterialvene oder der V. cava, (5) Blutungen aus den lumbalen, mittleren sakralen oder iliolumbalen Gefässen, (6) Verletzung der Harnleiter, (7) Bildung von Blutgerinnseln oberhalb oder unterhalb der Klemmen und (8) Blutungen von der Anastomose oder vom Transplantat.

Die an vierzehn Fällen gewonnenen Erfahrungen der Verfasser sind tabellarisch dargestellt.

RÉSUMÉ

Les auteurs décrivent en detail leur technique d'opération directe a l'aorte abdominale. Les dangers impliqués dans la procédure sont mis au point. Ce sont:

1. Glissement de l'aorte de la pince occlusive.
2. Rupture de l'aorte par la pince.
3. Lésion du duodenum.
4. Lésion de la veine rénale gauche, la veine mesentérique inférieure, ou la vena cava.
5. Hemorrhagie des vaisseaux lombaires, la sacrale médiale, ou des vaisseaux ilio-lombaires.
6. Lésion des urétères.
7. Formation d'un coagulum au dessus ou en dessous des pinces occlusives.
8. Hémorrhagie de l'anastomose et du greffon.

Leur expérience avec 14 cas est expliquée en table synoptique.

RESUMEN

Los autores describen en forma detallada su técnica de operación directa sobre la aorta abdominal. Se señalan los peligros inherentes que son: (1) El deslizamiento

de la aorta de la pinza oclusora. (2) La fractura o ruptura aórtica producida por la pinza. (3) La lesión del duodeno. (4) La lesión de la vena renal izquierda, la vena mesentérica inferior o la vena cava. (5) La hemorragia a partir de los vasos sacros medios o iliolumbares. (6) La lesión de los uerteros. (7) La formación de cóagulo por arriba o por debajo de las pinzas oclusoras, y (8) la hemorragia a partir de la anastomosis o del injerto.

Se exponen en un cuadro 14 casos.

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Nothing goes by luck in composition; it allows of no trick. The best you can write will be the best you are. Every sentence is the result of long probation. The author's character is read from title page to end. Of this he never corrects the proofs. We read it as the essential character of a handwriting without regard to the flourishes. And so of the rest of our actions. It runs as straight as a ruled line through them all, no matter how many curvets about it. Our whole life is taxed for the least thing well done. It is its net result. How we eat, drink, sleep, and use our desultory hours now in these indifferent days, with no eye to observe and no occasion to excite us, determines our authority and capacity for time to come.

—*Thoreau*

Advance in the Use of Blood Fractions in Surgery

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SINCE the beginning of man, blood has been recognized as the vital fluid upon which life itself depends. The men of medicine of antiquity constantly experimented with its clinical use. Much mystery was thrown about it.

It was not until 1628, when Harvey published his treatise on the circulation of blood, that progress in life saving increased tremendously. Many attempts were made through the ensuing years to transfuse blood, animal and human. Failure and death resulted in all instances.

In 1900, two hundred and seventy-two years after Harvey's discovery, Dr. Karl Landsteiner, a Viennese, published a paper announcing that blood can be classified in groups. Thus was unlocked the mystery of transfusion failure. Following this, Jansky, Moss and others confirmed Landsteiner's work and elaborated on it.

Even though grouping and matching of blood eliminated a great deal of the danger of transfusion, the technic of the operation was difficult due to coagulation of the blood. Crile (1907) devised a cannula which solved this problem but was so technical that the average surgeon found it too formidable for practical use.

Hustin of Belgium, in 1914, made a timely and important contribution by his description of an indirect blood transfusion using a dextrose-sodium citrate solution. On Nov. 14, 1914, Agate in Buenos Aires described a citrate solution method. Lewisohn and Weil, in 1915, each did much to standardize the citrate solution. Surgeons in World War I proved the value of blood transfusions in the saving of lives of men suffering hemorrhage and shock.

The ensuing years up to World War II (1939) found continuing research in the field of blood; but even to this day no method is known whereby a synthetic substitute for blood can be manufactured. The red blood cell remains a mystery. As World War I forced surgeons to find ways and means of doing transfusions, so did World War II place added demands. Here was a global war; blood was needed for combat troops all over the world. The sodium citrate solution seemed to be the best preservative; but because of its short preservation qualities, shipment of blood over thousands of miles was impracticable.

It was at this time that the profession turned to the use of blood derivatives.

As Surgeon General of the United States Navy, it was my responsibility, together with the Surgeon General of the United States Army, to develop a realistic program that would supply blood and plasma in great quantities. The American National Red Cross assumed the responsibility of collecting the blood. Through voluntary contribution, 14,000,000 pints of whole blood was collected. Some five million 500 cc. packages of dried plasma was provided for use; and 750,000 100 cc. vials of serum albumin were provided for the treatment of shock. It was not until 1943, when the A.C.D. solution was standardized, that whole-blood shipments over the world were possible.

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Twelve years have passed, and no preservative has been found that will preserve blood for useful transfusion beyond twenty-one to twenty-eight days. It is estimated that the life of a red blood cell in the body is one hundred and twenty days. Research says that an artificial means should be found to preserve blood cells for at least ninety days. With the tremendous increases of blood that a third World War would demand, all efforts should be made to bring this about.

The surgeon of today expects to have sufficient blood for the safety of his patient. Thoracic and cardiac operations make severe demands on blood donors of a community. The need can be solved in part by careful supervision of the amount of blood needed for a given case. Too often unnecessary blood is given merely because it is available. Then, too, excess transfusions can damage the kidney, the liver and other vascular structures.

Plasma can be stored in liquid or frozen form. Serum albumin is extremely stable and is so prepared that the transmission of disease is nil. Fibrinogen can be prepared commercially and is of great value to the obstetric and gynecologic surgeon.

Other fractions soon to be available are plasminogen and cerulo plasmin. Antihemophilic globulin is being distributed on a modified scale by the Michigan State Health Department. The single-donor frozen plasma can be processed in 125 ml. units. This is an excellent treatment for coagulation defects.

During the past two and one-half years the Division of Laboratories of the Michigan Department of Health has prepared fibrinogen for intravenous use under a research contract with the American Red Cross. A method has been developed which yields a stable and satisfactory product. The source of the material was fibrinogen from the crude Fraction I paste collected by the American Red Cross blood program.

Controlled clinical evaluation began on May 1952. One hundred and thirty-one cases have been reported out of about half of those under study. No cases are reported until one hundred and eighty days have passed. Anderson, McFall and Hertell, on Sept. 13, 1954, reported as indicated in Table 1.

TABLE 1.—*Conditions Treated with Fibrinogen*

Type of Case	*No.*	*Deaths*
Abruptio placentae	64	4
Miscellaneous postpartum conditions	21	5
Postsurgical — post-traumatic	20	8
Dead fetus	8	1
Transfusion reaction	5	1
Congenital hypofibrinogenemia	4	0
Post jaundice	2	1
Hemophilia	2	0
Heat stroke	1	0
Purpura haemorrhagica	1	0
Miscellaneous	3	2
	131	22

These data indicate that almost half of the conditions treated were diagnosed as abruptio placentae and that almost two-thirds were associated with pregnancy. Of the 64 patients of abruptio placentae, 60 responded satisfactorily. Of the 4 deaths recorded, only 1 was due to hemorrhage that failed to respond to fibrinogen therapy. Of the 21 patients with postpartum hemorrhage, 20 responded satisfactorily to the administration of fibrinogen. Of the 5 deaths that occurred in this group, only 1 was caused by hemorrhage. In the 20 reported cases of postsurgical and post-traumatic hemorrhage with 8 deaths, none of the deaths could be ascribed to a failure of the clotting mechanism. Those patients who died of hemorrhage represented medical problems that probably could not have been corrected by injections of fibrinogen.

The cause of the 1 death reported among the 8 cases of pathologic change resulting from long-term dead fetus was general sepsis with necrosis of the pelvic colon. The cause of the 1 death reported among 5 cases of transfusion reaction was lower nephron nephrosis; death occurred three days after the hemorrhage was controlled by whole blood and fibrinogen. In the additional 13 cases treated, the deaths of 3 patients were reported; however, one would not have expected fibrinogen to have been effective in these cases.

Table 2 indicates the dosage of fibrinogen used on the different types of cases. It should be pointed out that these dosages are likely suboptimal and reflect the limited supply available rather than a rational use based upon laboratory control.

Whole blood is an important part of therapy for most hemorrhagic states. The amount required is highly variable and is dependent upon many factors, among which is the level of fibrinogen. An examination of the case reports that have been received to date suggests that early and adequate use of fibrinogen may result in large savings of whole blood. The data suggest that, in many cases, hemorrhagic diathesis is accompanied by sharp decreases in platelet concentration. Whether or not this is due to the intravascular changes that have taken place *or* due to the administration of large volumes of banked blood cannot be determined at this time. Several physicians have observed a rise in the platelet count following the administration of fibrogen, which may be important if confirmed. I should certainly like to see more complete laboratory data on such cases, because they may point out which laboratory tests are most valuable as a guide to therapy.

SUMMARY

The use of whole blood in surgical procedures is desirable. In the treatment of surgical shock, burns and hemorrhagic states, it is imperative. The use of plasma, serum albumin, fibrinogen and other derivatives will not only conserve the supply of whole blood but can be employed where blood transfusion is an impossibility; for example, in the treatment of wounded men on the battlefield and in mass disasters in cities. The use of plasma substitutes such as Dextran, P.V.P., and others will save lives in the treatment of shock.

Research in blood goes forward. A study in the genetics of the blood group is under way at Harvard University. In the author's judgment, exploration in this field is extremely important and may answer

TABLE 2.—*Use of Fibrinogen*

Type of Case	*Cases Reported*	*Average Dose*	*Medium Dose*	*Range**
Abruptio placentae	64	3.7	3.0	1.0 - 12.0
Postpartum	21	3.7	3.0	1.3 - 9.0
Postsurgical and post-traumatic conditions	20	2.5	2.4	1.1 - 5.9
Dead fetus	8	3.0	3.6	1.5 - 14.0
Transfusion reaction	5	4.6	3.0	1.5 - 8.4
Jaundice	2	3.0	3.0	3.0 - 3.0
Miscellaneous	7	2.7	3.0	1.5 - 4.5
All Cases	127	3.6	3.0	1.0 - 14.0

*While the range of dosage varies from 1 to 14 Gm., it is interesting to note that the medium and average doses are similar.

some of the secrets locked up in the red blood cells.

Standardization of transfusion equipment is a live subject and should be resolved promptly.

The International Standards Organization is considering "functional interchangeability of transfusion equipment." The International Congress of Blood Transfusion and the International Congress of Hematology should move rapidly to consult with the International Standards Organization on this urgent matter.

Surgeons are the principal users of blood. As such, they should work closely with the men involved in blood research.

In any future war, mass disaster in industrial areas, as well as in large cities, will be commonplace. Atomic bombs and guided missiles will bring this about. Surgeons all over the civilized world will have the responsibility of saving the lives of the unfortunate citizens caught in the holocaust. Blood and its derivatives will be the surgeons' greatest allies.

The responsibility in first aid and rescue will fall on every citizen; the men of medicine must furnish the leadership.

ZUSAMMENFASSUNG

Die Verabreichung von Blut ist bei chirurgischen Eingriffen wünschenswert und bei der Behandlung von chirurgischem Schock, Verbrennungen und Blutungszuständen unerlässlich. Die Verwendung von Plasma, Serumalbumin, Fibrinogen und anderen Abkömmlingen des Blutes trägt nicht nur zu Ersparnissen des Vorrats an Gesamtblut bein, sondern kommt auch in Frago, wo Bluttransfusionen unmöglich, sind, wie z.B. bei der Behandlung von Verwundeten auf dem Schlachtfeld und in städtischen Massenunfallstationen. Plasmaersatzstoffe wie Dextran, P.V.P. und andere können lebensrettend Anwendung bei der Behandlung des Schocks finden.

Die Untersuchungen auf dem Gebiete der Blutforschung machen Fortschritte. In der Harvard Universität ist zur Zeit eine Untersuchung der Genetik der Blutgruppen im Gange. Der Verfasser hält die Forschung auf diesem Gebiet für äusserst wichtig und glaubt, dass sich auf diese Weise manche der in den roten Blutkörperchen verborgenen Geheimnisse lüften lassen.

Die Standardisierung der Transfusionsapparatur ist eine lebenswichtige Aufgabe, die unverzüglich gelöst werden sollte.

Die Internationale Standardisierungsorganisation beschäftigt sich mit dem Plan einer "funktionellen Auswechselbarkeit von Transfusionsapparaturen."

Der Internationale Kongress für Bluttransfusionen und der Internationale Kongress für Hämatologie sollten keine Zeit versäumen, diese dringende Angelegenheit gemeinsam mit der Internationalen Standardisierungsorganisation zu beraten.

Die Chirurgen sind die Hauptkonsumenten von Blue und sollten als solche mit den Blutforschern eng zusammen arbeiten.

In einem zukünftigen Kriege werden Atombomben und ferngeleitete Geschosse dazu führen, dass Massenkatastrophen in Industriegebieten und in grossen Städten zur Tagesordnung gehören. Es wird die Verantwortlichkeit der Chirurgen in der ganzen Welt sein, das Leben der von der Katastrophe Betroffenen zu retten. Bei dieser Aufgabe werden das Blut und seine Abkömmlinge die wichtigsten Hilfsmittel des Chirurgen sein.

Jedem Bürger wird eine verantwortliche Rolle für erste Hilfeleistung und Rettung zufallen, die Ärzte aber müssen die Führerschaft bei dieser Aufgabe übernehmen.

RÉSUMÉ

L'usage du sang dans la chirurgie est désirable. Dans le traitment du choc, brûlures et conditions hémorrhagiques c'est indispensable. L'usage de plasma, sérum,

albumine, fibrinogène et d'autres dérivées ne va pas seulement économiser la provision de sang, mais on s'en servira sous des conditions, ou la transfusion de sang est impossible, par exemple dans le traitement des blessés sur le champ de bataille et à des grands désastres dans les villes. l'usage des substitus de plasma, comme Dextran, P.V.P. etc. va sauver la vie dans le traitement du choc.

Le re cherche hématologique progresse. A l'université Harvard on etudie les génétiques du groupe de sang. Dans l'opinion de l'auteur cette sorte de recherche est extrèmement importante et pourra réveler quelques secrets enfermés dans les cellules rouges du sang.

La standardisation de l'équipement pour la transfusion est un sujet qui devait être réalisé instamment. L'organisation internationale des standards considère "L'échange functionel de l'équipement de transfusion." Le congrès international des transfusions du sang et le congres international d'hématologie devaient consulter instantanément l'organisation internationale des standards sur cette matière urgente.

Les chirurgiens sont ceux qui set servent le plus du sang. Pour cela ils devaient travailler ensemble avec ceux qui travaillent dans les recherches du sang.

Dans n'imports quelle guerre future il faut s'attendre des désastres formidables dans les zones industrielles et dans les grandes villes, causés par des bombes atomiques et des projectiles guidés. Les chirurgiens dans le monde entier auront la responsabilité de sauver la vie des citoyens infortunés quie seront pris dans cet enfer. Le sang et ses dérivées seront les meilleurs alliés du chirurgien.

Touts les citoyens seront responsables pour secours et sauvetage. Les hommes de médecine doivent être les guides.

RIASSUNTO

L'impiego di sangue in toto in chirurgia è noto: nella cura dello shock, delle ustioni, delle emorragie è indispensabile. Il plasma, le sieroalbumine, il fibrinogeno e gli altri derivati del sangue trovano impiego quando la trasfusione di sangue intero è impossibile, per esempio nella cura di feriti di guerra o nelle catastrofi del tempo di pace. Con i derivati del plasma, uqali il Dextran e il P.V.P. e simili si possono salvare i malati in shock. Gli studi proseguono; sono in corso, alla Harvard University, ricerche sui problemi genetici del sangue. Secondo l'opinione dell'autore tali studi sono di grande importanza e possono portare alla chiarificazione di problemi ancor a insoluti dei lggobuli rossi. L'organizzazione dei centri trasfusionali è materia d'importanza vitale e deve essere attuata prontamente. La International Standards Organization sta studiando uno strumentario per strasfusione intercambiabile. E' opportuno che il Congresso Internazionale sulla Trasfusione di Sangue interpelli l'International Standards Organization su questo argomento. I chirurghi sono quelli che adoperano maggiormente il sangue. Come tail essidevono lavorare in collaborazione con gli specialisti della trasfusione. In ogni guerra futura le grandi catastrofi nelle zone industriali e nelle grandi città saranno all'ordine del giorno a causa delle bombe atomiche e dei missili radiocomandati. I chirurghi di tutto il mondo avranno la responsabilità delle vite umane e troveranno nel sangue il miglior alleato. Ogni cittadino avrà il compito dei soccorsi di urgenza e i sanitari sarrano la guida.

RESUMEN

Es deseable el uso de sangre total en cirurgía, siendo imperativa en el tratamiento del choque quirúrgico, quemaduras y estados de hemorragia. En donde no es posible administrar una transfusión sanguínes puede emplearse plasma, seroalbúmina, fibrinógeno y otros derivados,

como por ejemplo en las heridas en campo de batalla o en los accidentes en masa en las ciudades. El uso de los substitutos del plasma como el Dextrán, la P. V. P. y otros, salvará muchas vidas como tratamiento del choque.

La investigación hemática continúa progresando; en la Universidad de Harvard se desarrolla un estudio genético de los grupos sanguíneos; segun el juicio del autor la exploración en est ecampo es extremadamente importance y puede resolver muchas incógnitas acerca de los eritrocitos. La estandarización del equipo de transfusión es un tema vital y debe resolverse rapidamente.

La International Standards Organization esta considerando "la función intercambiable del equipo de transfusión."

El congreso internacional de transfusión sanguínea y el congreso internacional de hematología debe consultar rapidamente a la organización mencionada acerca de este tema urgente.

Los cirujanos son los que usan más sangre, por lo que deben trabajar relacionados con los hombres dedicados a la investigación hemática.

En cualquier guerra futura, accidente masivo en área industrial, así como en las grandes ciudades, la sangre será utilizada grandemente; lo mismo acontece con las bombas atómicas y proyectiles dirigidos. Los cirujanos de todo el mundo civilizado tendrán la responsabilidad de salvar las vidas de los ciudadanos desafortunados que caigan en el holocausto. Los cirujanos tendrán sus mejores aliados en la sangre y sus derivados.

La responsabilidad de primeros auxilios reacerá en todo ciudadano, por lo cual los cirujanos deben proporcionarle el liderato.

SUMARIO

É aconselhável o uso de sangue total em processos cirúrgicos. Notratamento do choque cirúrgico, queimaduras e estados hemorrágicos, seu uso é imperativo. O uso de plasma, albumina, fibrinogenio e outros derivados não apenas conserva o contingente de sangue total, como tem indicação nos casos em que há impossibilidade de transfusão sanguínea, como p. ex. no tratamento de feridos de guerra e nos desastres em massa nas cidades. O uso de substitutos de plasma tais como Dextran, P.V.P. e outros, salvará vidas no tratamento do choque.

A pasquiza sôbre o sangue prossegue. Está em andamento na Universidade de Harvard um estudo sôbre a genética do grupo sanguíneo. Na opinião do autor é extremamente importante a exploração neste campo e pode dar a resposta a alguns dos segredos presos nos globulos vermelhos.

A padronização do equipamento de transfusão constitui assunto que deve ser resolvido prontamente.

A Organização Internacional d Padronização está considerando a "troca recíproca funcional dos equipamentos de transfusão." O Congresso Internacional de Transflusão de Sangue e o Congresso International de Hematologia devem tomar rápidas providências no sentido de consultar a Organização Internacional de Padronização sôbre êste assunto.

O sangue é principalmente usado pelos cirurgiões, os quais devem trabalhar em íntima relação com os que se dedicam à pesquizas sôbre o sangue.

Em qualquer guerra futura, catastrofes em massa em áreas industriais, bem como em grandes cidades serão comuns. Bombas atomicas e protéteis guiados trarão tais efeitos. Os cirurgiões em todo o mundo terão a responsabilidade de salvar as vidas dos infelizes cidadãos vitimiados. O sangue e seus derivados serão os maiores aliados dos cirurgiões.

A responsabilidade dos primeiros cuidados cairá sôbre todos os cidadãos; aos m'dicos cabe a liderança.

The Modern Surgical Treatment of Renal Tuberculosis

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THE subject of renal, ureteral and vesical tuberculosis has always appeared to me a most challenging one, with an equally challenging problem. One must approach this problem as an entity, from the clinical and pathologic as well as the urographic, pyelographic and surgical points of view.

The problems posed by tuberculosis of the urinary tract have multiplied since the introduction of the antibiotics and chemotherapy, for the latter have changed not only its pathologic picture but its prognosis and surgical treatment. Nevertheless, all the hopes raised by this new treatment in the past years have unfortunately not been realized. Certainly the advent of the new method has led to great progress in the treatment of renal tuberculosis. Nevertheless, the classic concept of early diagnosis followed by nephrectomy as recommended by Albarran still prevails, because it was and still is right. But today it is imperative to distinguish between the medical or so-called "closed cases" and the surgical or "open cases" of renal tuberculosis.

It is known, of course, that marked improvement has been recorded as a result of streptomycin therapy, and even cure in some cases in which there are minor, isolated lesions. It has also been observed that after a few days of streptomycin therapy the bacilli disappear from the urine. Experience has shown, however, that the treatment of renal tuberculosis with antibiotics will not always check the progress of the disease, and in those cases in which urograms or ureteropyelograms reveal failure of cicatrization of the tuberculous lesions, the disease becomes surgical. It then becomes necessary to remove the kidney — and the ureter as well if it is tuberculous—and to continue antibiotic treatment after the operation. Consequently, I consider nephrectomy indicated in all cases of unilateral renal tuberculosis.

The surgical procedure is determined by the pathologic character of the lesion in the kidney and ureter as diagnosed preoperatively by radiographic, urographic or ureteropyelography. If the tuberculous lesion is unilateral and located in a portion of the kidney that can be removed, or if it is limited to a calix or is an anomaly, such as double kidney, a partial nephrectomy is indicated; also, in certain cases of pyeloureteral tuberculosis a conservative operation may be indicated.

It is therefore necessary in determining a course of procedure in renal tuberculosis, both from a clinical and a therapeutic standpoint, to consider treatment in relation to three distinct phases: (a) before nephrectomy; (b) after nephrectomy, and (c) in the single kidney.

To begin with, it is most important, before deciding which surgical procedure is to be used, to keep in mind the diversity of the surgical pathologic conditions that may be encountered today in cases of

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renal tuberculosis; for, in spite of the conservative treatments made possible by the numerous antibiotics, some operations are definitely indicated even in cases of single kidney and ureter, as I shall presently explain.

I shall not discuss primary isolated tuberculosis of the ureter, because in my opinion, this is extremely rare; however, as is well known, the ureter frequently becomes tuberculous at a time when the kidney, bladder and genital organs, male or female, are already invaded by the tuberculous disease.

It is difficult, within the compass of an article, to discuss all these problems as fully as would be desirable. For the sake of brevity, therefore, I have arranged the salient point in tabular form (Tables 1 and 2). In Table 1 will be found a classification based on the clinical, anatomic, pathologic, urographic and surgical study of renal tuberculosis, indicating "what to do" *before* nephrectomy, *after* nephrectomy and in the case of the *single* tuberculous kidney.

Table 2 indicates the various types of operation I have performed in cases of renal tuberculosis. This table supplies some idea of the diversity and complexity of the problems presented by tuberculous lesions encountered in approximately 450 cases.

Tuberculosis of the urinary tract, which is unilateral in 80 to 90 per cent of cases, is always secondary to tuberculosis elsewhere in the body, whether in the lungs, the lymphatics or the skeleton, and reaches the kidney by way of the blood stream. The pulmonary or other primary foci may have become quiescent by the time symptoms develop in the genitourinary tract or the kidneys. Renal tuberculosis includes the so-called "closed cases" in which the condition is amenable to medical treatment, and the "open cases" in which surgical treatment is required. In the "closed cases" are included cases of miliary tuberculosis and tuberculous nephritis, in both of which Koch bacilli appear in the urine. As long as the lesions remain within the renal parenchyma, with bacilluria as the sole symptom, they may heal without surgical treatment; but once the excretory tract

TABLE 1.—*Treatment of Renal Tuberculosis*

Administer Before Nephrectomy
1. Medical treatment with antibiotics.
2. For tuberculous kidney with a normal ureter, perform nephrectomy.
3. For tuberculous kidney and ureter demonstrated by ureteropyelographic study, do a ureteronephrectomy or a nephro-ureterectomy.
4. In cases of tuberculous reno-ureteral anomaly, or isolated lesions of the calices, do a partial nephrectomy.
5. In some cases of far advanced tuberculous pyeonephrosis, do a nephrostomy followed by secondary nephrectomy (nephrectomy in two stages).
6. For ureteropyelic or ureterovesical stenosis in ureteral tuberculosis, when the kidney is normal, perform conservative plastic operations on extremity of the ureter.
7. When conservative operations on the tuberculous kidney and ureter are unsuccessful, do a nephrectomy or a nephro-ureterectomy.
After Nephrectomy
For the closed or open tuberculous ureteral stump, do a secondary ureterectomy.
For draining the tuberculous ureteral stump, use various conservative treatments (cystoscopy, fulguration, meatotomy, catheterization, etc.).
Implant the tuberculous ureteral stump into the skin.
When tuberculosis has invaded the ureter and bladder, and does not respond to simple cystoscopic fulguration or antibiotics, remove the ureteral stump and the intravesical portion of the ureter.
Perform endoscopic resection of the tuberculous vesical neck.

TABLE 2.—*Treatment of the Single Kidney*

1. Plastic ureteropelvic procedures (for hydronephrosis)
2. Pyelo-ureteral anastomosis
3. Nephrostomy
4. Pyelostomy
5. Ureterostomy
6. Ureterocutaneous implantation
7. Ureterointestinal implantation
8. Intravesical or extravesical plastic operation on the lower end of the ureter
9. Ureterointestinal implantation followed by total cystectomy

has been invaded the classification must be changed to "open" tuberculosis, and nephrectomy becomes imperative. In such cases the tuberculous process is well established and has invaded the renal parenchyma, forming caverns like those observed in cases of pyeonephrosis. The kidney expels its caseous contents into the calices, renal pelvis and ureter, producing pyuria, hematuria and vesical symptoms that require urologic examination.

The various phases of symptoms and diagnosis have been discussed in various contributions, which make repetition superfluous.[1]

In modern urology, however, when differential diagnosis has definitely established the existence of tuberculosis of the urinary tract, the essential problem is how to proceed.

Table 1 indicates the clinical, therapeutic and anatomopathologic classification of medical and surgical treatments that I consider most appropriate for the indicated conditions.

TREATMENT OF RENAL TUBERCULOSIS

Before Nephrectomy.—Antibiotics: The progress achieved in medical treatment with antibiotics, and in particular with streptomycin, has been remarkable both from a clinical and a surgical point of view. Prognosis, diagnosis and therapeutic methods have been revolutionized.

Streptomycin has definitely ameliorated and controlled the disease; it has healed some early tuberculous lesions of the renal parenchyma, of a calix of a papilla or of the pyeloureteral excretory tract; it has likewise cured tuberculous pyelonephritis due to excretory bacilluria.

The treatment was usually begun with 1 Gm. of streptomycin and 1 cc. of chaulmoogra oil, with surprising results: disappearance of the Koch bacilli from the urine in eight days and, amazingly, control of all the symptoms. But when pyelographic study has revealed the existence of tuberculous cavities or tuberculous pyelonephrosis, it becomes necessary to continue the combined treatment with antibiotics and other drugs in order to prepare the patient for surgical intervention. At present, in all cases of renal tuberculosis, the medical treatment is administered for two to three weeks before operation and is continued for two to three weeks after operation.

With this preoperative and postoperative treatment, fever is absent and the postoperative sequelae are minimized. The wounds heal rapidly without drainage. One may state, therefore, that the clinical results and actual cures are truly remarkable. For this reason, the administration of antibiotics and chemotherapy is formally indicated in all cases, *before* and *after* operation on the urinary tract.

At present I am prescribing a new preparation, a *"combiotic,"* 2 cc. of which contains 0.5 Gm. of dihydro-streptomycin and 400,000 units of crystalline penicillin (the dose is 2 cc. twice daily for one or two weeks *before* operation and two to three weeks *after* operation).

This treatment is completed, after operation, by administration four times daily of either a combination of three sulfamides (sulfadiazine, sulfathiazole, sulfamerazine) or indifferently of aureomycin, terramycin or achromycin. The surgically treated patients leave the hospital with clear urine, without symptoms of cystitis, with a healed wound and in a very satisfactory general condition.

This combination of chemotherapy and antibiotics gives good results. Its efficacy is limited, however, owing to the toxicity of the products involved and their tendency to produce intolerance.

When the patient has left the hospital I prescribe an intermittent treatment under clinical, urographic and bacteriologic supervision, for six months to a year, with

streptomycin, 1 Gm. twice weekly, para-aminosalicylate of soda, 3 gr. four times daily, and isoniazid (hydrazide of isonicotinic acid), 150 mg. twice daily. This last combination is very well tolerated by the organism in the majority of cases, but, if pyuria persists after one year, treatment should be prolonged until there is complete microscopic disappearance of bacilli, pus cells and red blood cells from the urine.

The same treatment is imposed in all cases of surgical intervention for renal tuberculosis, as in all cases of inoperable bilateral renal tuberculosis.

To this treatment I add vitamin therapy, heliotherapy, dietary measures, complete rest, and preferably a prolonged stay in a sanatorium.

It seems beyond doubt that antibiotics and chemotherapy have an important future, not only as a basis for curative medical treatment but as urinary antiseptics, and in all preoperative and postoperative treatments for renal and ureteral tuberculosis.

For Renal Tuberculosis with a Normal Ureter. Nephrectomy is indicated. In cases of *unilateral* renal tuberculosis, in which urographic, cystoscopic and ureteropyelographic studies reveal the presence of open destructive tuberculous lesions or advanced tuberculous cavities, with a normal bladder and ureter, a simple nephrectomy should be done immediately *after* preoperative medical treatment with the new antibiotics.[2]

Since the introduction of the antibiotics, cases of renal and ureteral tuberculosis necessitating nephrectomy have become less numerous. This result has been observed in all urologic services in the hospitals of New York City, in which the number of nephrectomies performed for renal tuberculosis has dwindled considerably; but it remains true that when open tuberculous lesions are discovered in the renal parenchyma or excretory tract, the only curative treatment is still nephrectomy. This is as true today as it was in the time of Albarran, in spite of all modern methods of exploration, antibiotic treatments and chemotherapy.

It is quite true that antibiotics control the minimal lesions of the renal parenchyma in cases of "closed" renal tuberculosis, but they will not cure a destructive renal lesion with advanced ulcerocaseous or ulcerocavernous lesions.

In the latter instance, prolonged antibiotic treatment will only delay surgical intervention, and *late* nephrectomy yields less satisfactory clinical results than does *immediate* nephrectomy.

When both kidney and ureter are tuberculous as revealed by uretero-pyelographic study, ureteronephrectomy or nephro-ureterectomy is indicated.

In the majority of cases in which intravenous urographic or retrograde ureteropyelographic study has revealed advanced renal and ureteral lesions, as in hydronephrosis or pyelonephrosis, with infiltration of the ureter, hydroureter, or tuberculous megalo-ureter, ureteronephrectomy is inevitable. If an accurate diagnosis has been established before operation and it appears necessary to remove the entire tuberculous ureter, one may begin with a low lateral abdominal incision for extraperitoneal exposure of the ureter, which is then divided and ligated between two forceps behind the bladder; this first stage of combined ureteronephrectomy, which is performed in two stages, as aforedescribed, is followed by a lumbar incision to complete the operation.[3] I believe that these two separate incisions are preferable to the enormous, more traumatizing incision required for nephro-ureterectomy.

In some cases of tuberculous ureteritis with tuberculous ulcers of the bladder invading the ureteral orifice, some surgeons prefer to do a simple nephrectomy with subtotal ureterectomy, followed by cuta-

neous implantation of the ureteral stump, in order to permit drainage and complementary treatments of the ureteral stump. I do not recommend this procedure; experience has shown that actually, in a very large number of cases, it becomes necessary to do a secondary ureterectomy to cure a lumbar urinary fistula and to relieve incurable persisting tuberculous cystitis, especially in cases of vesico-ureteral reflux. On the contrary, it is recommended that the tuberculous portion of the vesical trigone be removed at the same time as the tuberculous ureter which has infiltrated this portion of the bladder.

Cystoscopic fulguration of a tuberculous ulcer of the bladder and the corresponding ureteral orifice should be done before or, preferably, after the nephrectomy; this yields remarkable results in curing the tuberculous cystitis and permits release of the mechanical obstruction due to hydroureter or hydronephrosis. It will also, in some cases, cure the pyelic dilatations of the whole pyelo-ureteral system.

This simple fulguration or cystoscopic meatotomy of the intravesical portion of the ureter, particularly after nephrectomy, facilitates not only drainage of the ureter but cicatrization of the tuberculous ulcers of the bladder, and releases the stenoses and constrictions that are the direct cause of obstruction and urinary stasis, as a source of infection.

In cases of tuberculous reno-ureteral anomalies or isolated lesions of the calices, partial nephrectomy is recommended.

In the domain of renal anomalies, pyelographic study has revealed some cases of reno-ureteral tuberculosis; for instance, in cases of double kidney or horseshoe kidney, in which partial nephrectomy or hemi-uretero-nephrectomy are indicated.[4]

Three types of double kidney were encountered: (1) a double kidney with two ureters fusing before reaching the bladder; (2) a double kidney with two independent ureters opening into the bladder, and (3) a double kidney with two ureters, one being ectopic, corresponding to the upper role of the tuberculous double kidney and opening outside the bladder, which causes incontinence.[5]

For these forms of tuberculous double kidney, as I have already stated in earlier contributions, partial nephrectomy or partial nephrectomy with ureterectomy is done.

Partial nephrectomy may also be indicated in cases of simple tuberculous kidney with destructive papillary or caliceal lesions responsible for hydrocalyx or partial hydronephrosis, but always on condition that not more than half of the renal parenchyma is involved in the tuberculous process, which should be confirmed functionally, pyelographically and at the time of operation.

I would also emphasize the advantages of partial nephrectomy in all cases in which the tuberculous lesion is confined to one of the two poles of the kidney. In these cases, however, it is necessary to ascertain beforehand whether the position of the renal and vascular pedicle will permit this conservative procedure.[6]

In some cases of far advanced tuberculosis pyelonephrosis, nephrostomy followed by secondary nephrectomy is indicated (the nephrectomy in two stages).

In certain cases of advanced tuberculous pyelonephrosis, when the patient shows marked toxicity, fever and poor general condition, it is preferable to do an operation in two stages, beginning with a nephrostomy to permit drainage not only of the multiple pyelonephrotic cavities, but of the perinephritic and paranephritic or subdiaphragmatic abscesses that are often present. Nephrostomy permits drainage of pus from the cavities, reduction of the pyonephrotic sacs and immunization of the patient against infection, thus raising his physical resistance and simplifying the

technic of the second stage of the operation. After two or three weeks of drainage, following this preliminary procedure, during which the general condition of the patient should improve, a secondary nephrectomy is performed, or a nephro-ureterectomy, if the ureter has been invaded by the tuberculous process. Many lives have been saved and definite cure has been obtained with this two-stage procedure.[7]

Conservative plastic operations on the end of the ureter may be performed for ureteropyelic or ureterovesical stenosis in cases of ureteral tuberculosis when the kidney is normal.

Two groups of conservative plastic ureteral operations, on the ureter, designed to conserve the kidney, must be considered: (a) those of the *upper end* of the ureter for stenoses, or for intrinsic or extrinsic ureteropyelic obstructions, and (b) those of the *lower end* of the intravesical or extravesical portion of the ureter, for stenosing constrictions of the terminal portion of the tuberculous ureter.

With regard to the first group (a), conservative plastic operations on the *upper* end of the ureter for pyelocaliceal dilatations or tuberculous hydronephrosis, with good renal function and ureteropyelic constrictions, the kidney is exposed by the lumbar route, and nephrolysis and ureterolysis are performed to permit a plastic procedure or resection of the pelvis and to eliminate all ureteropyelic obstructive factors, as currently practiced in nontuberculous hydronephrosis.[8]

In some cases it will be necessary also to resect the ureter and transplant it to another and more dependent portion of the pelvis and to do a temporary nephrostomy.

In the second group (b) one must consider the different types of possible surgical intervention to save a kidney threatened by hydroureter and tuberculous hydronephrosis of moderate degree, but still with good function and without pyelographic evidence of destructive lesions or tuberculous cavities. The purpose of these operations on the lower end of the ureter is to eliminate factors causing ureteral obstruction, to restore the excretory function of the kidney and to obtain satisfactory renopyeloureterovesical drainage, in order to preserve the functional integrity of the excretory apparatus.

Operations on the *lower* end of the ureter may be classified in four categories:

1. The extravesical operations on the lower end of the ureter now in vogue, which I have often performed in cases of stenosing constrictions of the lower end of the ureter, involving extravesical or intravesical lesions, when the inflammatory processes of the male or female genital organs have invaded the terminal portion of the ureter.

2. Operations designed to relieve stenosing constrictions due to extraureteral compression of the iliac lymphatic glands, or to liberate fibrous adhesions produced by a pelvic or appendiceal abscess that would retard ureteral dynamism.

3. Operations performed for the two types of tuberculous ureteritis, with stenosing infiltration of the wall of the ureter in rosary shape, and in cases of hydroureter.

4. Partial resection of the ureter with terminoterminal anastomosis may be done in cases of isolated surgical pathologic constriction of the median portion of the ureter.

Before resorting to conservative plastic operations, however, it is necessary to determine, ureteropyelographically or urethrocystographically, the degree of vesicoureteral tuberculous involvement and the presence or absence of a vesico-ureteral reflux. After examining the differential renal function by excretory pyelographic study or by ureteral catheterization, it is necessary to ascertain whether the kidney

still functions satisfactorily, and whether a sufficient amount of intact renal parenchyma remains to justify an attempt to preserve the kidney. If the kidney shows tuberculous cavities or advanced hydroureteronephrosis, it is futile to perform a conservative operation, for this would always necessitate a second intervention, since the plastic procedure has no curative effect.

If the bladder is tuberculous, as in the case of the small "tuberculous trigonal bladder" with a vesico-ureteral reflux, one must choose the surgical method very carefully, especially in cases of single kidney, taking into consideration the inherent conditions existing in the individual case.

In some cases of stenosing constrictions of the *lower* end of the ureter, I resect the ureter and transplant it to another part of the bladder, utilizing a vesical flap when the tract is too short. In a ureter with stricture, permitting resection of 4 to 6 cm., it is possible to do a ureteroneocystostomy with temporary drainage of the bladder.

In the presence of stenosing constrictions of the *lower* end of the ureter, and when the pathologic lesion is intramural or trigonal, a conservative operation by the intravesical route is recommended. This operation, which consists of removing the stenosing and infiltrating intramural portion of the ureter, is followed by implantation of the remaining portion of the ureter directly into the bladder, or to another part of the bladder, with a combined extravesical or intravesical technic. This is an operation that I have performed with satisfactory results for many years, the first being in 1929, in a case of tuberculous vesico-ureteral reflux with hydro-ureter and hydronephrosis.

But it is desirable, in certain cases of stenosing constrictions of the terminal portion of the ureter, to operate cystoscopically, performing a simple meatotomy with the electric bistoury or by simple fulguration, as I have done in some such cases.

Before concluding this part of the article, I wish to draw attention to the fact that these plastic operations on the *lower* end of the ureter are not always, in my opinion, satisfactory; as a matter of fact, in some cases, after these plastic operations, we have observed a vesico-ureteral reflux and the formation of a hydroureter and hydronephrosis, occasionally necessitating nephrectomy or nephroureterectomy.

When conservative operations on the tuberculous kidney and ureter prove unsuccessful, a nephro-ureterectomy is indicated.

As I have stated, when conservative operations on the tuberculous kidney and ureter prove unsuccessful, and ureteropyelograms reveal a hydronephrotic kidney, with persisting pyelo-ureteral infection that fails to respond to appropriate medical and urologic treatment, it will be necessary to perform nephro-ureterectomy, always on condition, however, that the lesion is *unilateral* and that the opposite kidney is intact.

After Nephrectomy. — After nephrectomy it is essential to take into consideration any remaining pathologic condition of the tuberculous urinary tract, whether attributable to errors in preoperative or postoperative diagnosis, as well as any concomitant tuberculous lesions in the ureteral stump or bladder or in the remaining kidney and ureter of the opposite side.

In cases of closed or open tuberculous ureteral stump, a secondary ureterectomy is indicated.

When the ureteral stump left *in situ* after nephrectomy is the direct cause of a lumbar fistula, and cystitis and pyuria persist owing to tuberculous ureteritis and periureteritis, a secondary ureterectomy

will be required to remove the entire remaining ureteral stump.

Complications occurring as a result of failure to remove a septic tuberculous ureteral stump are of two types: (a) those occurring in cases of *closed* tuberculous ureteral stump and (b) those occurring in cases of *open* tuberculous ureteral stump.

In cases of *closed* tuberculous ureteral stump, the symptoms of pyuria and cystitis persist after nephrectomy; they are accompanied by tuberculous vesical ulcers with insufficient drainage of the tuberculous ureteral stump into the bladder; since there is no vesico-ureteral reflux, the upper end of the ureteral stump is closed and the presence of a stenosing obstruction in the intravesical portion is responsible for defective drainage, which occurs only into the bladder; under these conditions a simple fulguration is indicated, with catheterization and irrigation of the ureter. If retrograde ureterographic study reveals tuberculous ureteritis or hydroureter of the stump, a secondary ureterectomy will relieve suffering and protect the opposite kidney from infection.

In cases of *open* ureteral stump after nephrectomy, two aspects must be considered:

Some surgeons, after a simple nephrectomy, implant the ureteral stump in the skin, in order to facilitate drainage and irrigations in the hope of final cicatrization; this procedure of subtotal ureterectomy, however, presents certain dangers. It leaves *in situ* a tuberculous ureteral stump; it is quite evident that, in spite of all possible treatment, the tuberculosis in the ureter has no chance of cure, so that sooner or later the ureter must be removed.

In the second instance of *open* ureteral stump, cystoscopic study will reveal the presence of a gaping orifice, and the cystogram shows the vesico-ureteral reflux, which is responsible for a lumbar fistula following nephrectomy. To avoid this postoperative complication it is essential, in my opinion, to do a secondary ureterectomy, as I have already indicated.

In certain cases of tuberculous ulcers of the bladder, with tuberculous infiltration of the vesical trigone, ureterectomy with partial cystectomy may be indicated in order to remove the infiltrating ureterotrigonal portion, with temporary drainage of the bladder.

Various conservative procedures may be employed for draining the tuberculous ureteral stump (cystoscopy, fulguration, meatotomy, catheterization, etc.).

As I have repeatedly emphasized, it is always necessary to consider possible urologic conservative measures for draining the ureteral stump *before* doing a secondary ureterectomy. Such measures include cystoscopy, fulguration, meatotomy and ureteral catheterization with ureteral instillations, in the hope of sterilizing the remaining portion of the ureter, obtaining adequate drainage, dilating any stenosing constrictions present, and encouraging cicatrization of the tract.

I shall not discuss cutaneous implantation of the ureteral tuberculous stump, since, as I have stated, I would not recommend it. After its use, in the majority of cases, it becomes eventually necessary to do a secondary ureterectomy.

When tuberculosis has invaded both the ureter and the bladder and does not respond to simple cystoscopic fulguration or to medical and urologic treatment, the ureteral stump and the intravesical portion of the ureter should be removed.

In cases of post-nephrectomy ureterovesical tuberculosis in which the condition fails to respond to conventional conservative procedures, simple cystoscopic fulguration or antibiotic treatment, when ureteral catheterization is impossible and the suffering of the patient persists, it becomes necessary, in order to avoid a ves-

ico-ureterorenal reflux in the opposite kidney, to do a secondary ureterectomy and, in certain cases, to remove the ureterotrigonal portion of the bladder, in the hope of arresting progress of the disease.

In certain cases of tuberculosis of the bladder, with vesical retention, it is essential to perform an *endoscopic resection of the vesical neck,* in order to eliminate the residual urine and the ascending infection of the opposite kidney due to a vesico-ureterorenal reflux. The different types of *obstructive* pathologic lesions of the bladder neck are well known, and the transurethral operation is recommended in all cases of sclerosis and hypertrophy of all elements of the bladder neck, as well as in cases of multiple cysts and polyps or hypertrophy of the prostate gland causing urethrovesical obstruction.

This conservative operation eliminates obstruction of the bladder neck, permits better drainage and precludes the possibility of a vesico-ureterorenal reflux on the opposite side.

The conservative operations used in cases in which there are two kidneys and unilateral tuberculosis may likewise be considered for the treatment of patients with a single kidney and pyelo-ureterovesical tuberculosis, or in cases of tuberculosis of a congenital single kidney. However, the most scrupulous attention to the pathologic condition of the kidney, renal pelvis, ureter and bladder will be necessary. A complete examination must be made of the entire urinary tract in order to reevaluate renal function and to determine the degree of renal destruction. The presence of any obstructive lesions causing hydronephrosis, hydro-ureter, or extravesical or intravesical stenosing constrictions of the terminal portion of the ureter due to the small tuberculous trigonal bladder, frequently responsible for the vesico-ureterorenal reflux, must be determined.

In order to avoid a repeated description of the operations mentioned in preceding paragraphs, which may also be performed in cases of single kidney, I shall discuss only the most important and up-to-date operations in this category. They should, however, never be attempted until the pathologic lesion has been definitely established by cystoradiopyelographic and cystographic diagnosis, which will indicate the operative procedure suitable for each individual case.

The plastic conservative operations most commonly used are those designed to relieve hydronephrosis and are always accompanied by nephrostomy or pyelostomy.

Nephrostomy is likewise considered in cases of advanced tuberculous pyeonephrosis, in the hope of prolonging the life of the patient. Nephrostomy is also resorted to for temporary derivation of the urine before one proceeds with plastic operations on the lower end of the ureter. If, on the other hand, the condition of the patient is favorable and the lower end of the ureter and the condition of the bladder permit, a conservative plastic operation may be performed for intravesical or extravesical removal of the portion of the ureter involved in the stenosing constrictions.

In the presence of a small tuberculous trigonal bladder with diminished vesical capacity the plastic conservative operations are much more delicate and difficult, even if performed by the extraperitoneal route. In these circumstances it is preferable to perform a cutaneous or rectal implantation of the ureter and to do a total cystectomy; I have successfully accomplished this in some cases. In the single kidney, however, when all conservative procedures fail, there may be an obvious indication for transplantation of the ureter to the skin or to the bowel for temporary or permanent drainage, particularly ureterocutaneous implantation in

advanced cases of hydro-ureter and hydronephrosis.

I would mention also the cysto-ilioplastic operation recently described by Professor Cibert in the *Journal d'Urologie*. This consists in creating an artificial bladder, a sort of large vesical diverticulum, to retain the infected urine. I have no personal experience with this operation, having had no occasion to use it. But as long as one has to deal with a bladder involved in advanced and incurable tuberculosis, it is always preferable, in my opinion, to implant the ureter in the intestine and perform a total cystectomy, in order to get rid of an organ that has become a veritable focus for reinfection and to eliminate all pathologic factors from the organism.

Eleven years ago I performed a total cystectomy with uretero-intestinal anastomosis for tuberculous bladder. The patient's condition today is satisfactory, and she lives a regular and comfortable life; intravenous urographic study reveals a practically normal kidney and ureter. It appears, therefore, that the intestinal mucosa accommodates itself nicely to the presence of the Koch bacillus.

Finally, one must not lose sight of the fact that surgical treatment is only the first step toward cure of reno-ureteral and vesical tuberculosis. After operation, patients are preferably sent to a sanatorium for all postoperative treatments with antibiotics, chemotherapy, heliotherapy, dietary regimes, appropriate hygiene and rest. In spite of all treatments, however, some patients will suffer a recurrence of the disease, with the symptoms of pyuria, cystitis, vesical tenesmus and renal pains. These are the result of urinary stasis or cysto-ureteropyelic reflux, which will require further urologic, urographic and surgical treatment.

In conclusion, I would state that since the introduction of the antibiotics and new chemotherapy the death rate for renal tuberculosis has dropped considerably; however, tuberculosis still makes considerable ravages. In the majority of fatalities, however, death is attributable to generalized tuberculosis and only rarely to tuberculosis of the organs of the urinary tract.

SUMMARY AND CONCLUSIONS

In reviewing the present status of the surgical treatment of renal tuberculosis as affected by modern medical advances, one is confronted by a complete change not only in the pathologic conditions of the urinary tract to be corrected but in the type of surgical intervention indicated. Both conservative and radical operations that could not be attempted formerly are now possible and are performed successfully, with good results, under the protection afforded by the new drugs and antibiotics. Under the influence of the latter, toxic, infected, feverish patients presenting a grave risk for any operative procedure improve to such a degree that the necessary operation can be performed more safely. Also, conservative operation to prevent complications and secure better drainage is possible. Since many hitherto inoperable patients have been brought into the operable category, numerous patients with tuberculosis of the kidneys, who would otherwise have died, are alive today. The antibiotics and chemotherapy have led to cure of large numbers of patients with early pulmonary tuberculosis, which is responsible for involvement of the kidneys in the largest proportion of cases of renal tuberculosis. The BCG vaccine is becoming increasingly popular as a preventive of pulmonary tuberculosis, thus suggesting that the number of cases of pulmonary tuberculosis will become progressively lower, and likewise, of course, renal tuberculosis, as one of its sequelae, will become less prevalent.

The danger of leaning too heavily on the aid proffered by the antibiotics and chemotherapy can not be too strongly emphasized. The prompt disappearance of symptoms of urinary tubercle bacilli frequently offers a false sense of security. Even when the patient appears cured, latent foci of the disease may persist, and may become active months or years later. Patients must be told of the vital importance of continuing medical treatment for at least six months to a year after operation, and should be directed to return for complete urologic and urographic check-ups upon the slightest recurrence of symptoms. If, on such examination following medical treatment before or after operation, it is found that the renal function is diminished and urinary symptoms persist, and if urographic and cystoscopic data indicate that the destructive process of tuberculosis of the kidneys is progressing, operation should not be delayed, because in many such cases nephrectomy may yield permanent cure.

RÉSUMÉ

En parcourant l'état présent du traitement de la tuberculose, comme influé par les avances modernes en médecine, on est confronté d'un changement total, pas seulement dans les conditions pathologiques des voies urinaires atteintes, mais dans le choix de l'Intervention chirurgicale indiquée. Des operations conservatives et radicales qui autrefois ne pouvaient pas être exécutées avec succès, sont exécutées maintenant avec bon resultats sous la protection donnée par les nouveaux medicaments et antibiotiques. Sous l'influence de ces derniers des malades toxiques, infectes, fiévreux présentant un problème sérieux pour n'importe quelle procédure operative, s'améliorent maintenant tellement que les opérations nécessaires peuvent être exécutées avec plus de sureté. Aussi l'operation conservative pour prévenir des complications et assurer un meilleur drainage est possible. Puisque beaucoup de malades jusqu'à présent inopérables sont maintenant dans la catégorie des opérables, beaucoup de patients atteints de tuberculose rénale, qui autrefois seraient morts, maintenant sont en vie. Les antibiotiques et la chémotherapie ont réussi de guerir de grands nombres de malades avec tuberculose pulmonaire au commencement, qui est responsable pour atteindre les reins dans la plus grande proportion des cas de tuberculose rénale. L'usage du vaccin B.C.G. devient de plus en plus populaire comme préventif de la tuberculose pulmonaire ce qui fait présumer, que le nombre des cas de tuberculose pulmonaire diminuera de plus en plus, et naturellement, de mème tuberculose rénale, comme une de ses conséquences, sera moins prévalante.

Le danger de se fier trop a l'aide offert par les antibiotiques et chémotherapie ne peut pas être accentué assez fort. La prompte désapparence des symptomes et des bacilles du tuberculose souvant offre un faux sentiment de securité. Mème que le malade parait être guéri, des foyes dormants de la maladie peuvent exister et devenir actifs après des mois ou années. Il faut instruire les malades de l'importance vitale de continuer le traitement médical au moins pendant 6 mois à une année après l'opération et les diriger de retourner pour un examen complet urologique et urographique a la moindre réapparence des synptomes. Si à un tel examen suivant le traitment médical avant ou après l'opération on trouve que la fonction rénale a diminuée et que les symptomes urinaires continuent, et si les resultats urographiques et cystoscopiques indiquent que la déstruction tuberculose dans les reins est en progrès, l'opération ne devait pas être reculée, parceque souvent dans de tels cas la nephrectomie donne une cure permanente.

ZUSAMMENFASSUNG

Eine Betrachtung des heutigen Standes der chirurgischen Behandlung der Tuberkulose unter dem Einfluss neuer medizinischer Fortschritte führt zu der Erkenntnis einer völligen Veränderung nicht nur des pathologischen Materials, das zur Behandlung urologischer Veränderungen kommt, sondern auch der Art chirurgischer Eingriffe, die angezeigt sind. Sowohl konservative als auch radikale Operationen, die früher unausführbar waren, sind heute unter dem Schutze der neuen Medikamente und Antibiotika möglich und erfolgreich. Unter dem Einfluss der Antibiotika verbessert sich der Zustand toxischer, infizierter, fiebernder Kranker, die ein grosses Risiko bei jedem chirurgischen Eingriff tragen, in einem solchen Masse, dass die notwendigen Operationen mit grösserer Sicherheit ausgeführt werden können. Ferner lassen sich konservative Operationen zur Verhütung von Komplikationen und zur Sicherung besser Dränierung ausführen. Viele bisher nicht operierbare Kranke können heute der Chirurgie zugeführt werden, und infolgedessen befinden sich zurzeit zahlreiche Patienten mit Nierentuberkulose am Leben, die sonst schon gestorben wären. Die Antibiotika und die chemotherapeutischen Mittel haben zur Heilung einer grossen Anzahl von Kranken mit frühzeitiger Lungentuberkulose, die für die grosse Mehrzahl der Beteiligung der Nieren verantwortlich, ist, geführt. Die BCG-Vakzine erfreut sich einer wachsenden Beliebtheit als Vorbeugungsmittel der Lungentuberkulose, sodass man ein allmähliches Abnehmen der Zahl der Fälle von Lungentuberkulose und infolgedessen auch der Zahl einer ihrer Folgeerscheinungen, der Nierentuberkulose, erwarten kann.

Die Gefahr, die darin liegt, sich allzu sehr auf die Wirkung der Antibiotika und der chemotherapeutischen Mittel zu verlassen, kann nicht genügend hervorgehoben werden. Das rasche Verschwinden der Symptome und der Tuberkalbazillen im Urin gibt häufig ein falsches Gefühl der Sicherheit. Selbst wenn der Kranke geheilt scheint, können verborgene Herde der Krankheit bestehen, die noch nach Monaten oder Jahren aktiviert werden können. Die Kranken müssen auf die lebenswichtige Bedeutung der Fortsetzung medikamentöser Behandlung für mindestens 6 bis 12 Monate nach der Operation aufmerksam gemacht werden und müssen beim leisesten Auftreten von Rückfallserscheinungen einer völligen urologischen und urographischen Nachuntersuchung unterzogen werden. Wenn derartige Untersuchungen nach medikamentöser Behandlung vor oder nach der Operation ein Nachlassen der Nierenfunktion ergeben, und wenn urologische Symptome bestehen bleiben, wenn ferner urographische und zystoskopische Untersuchungsergebnisse andeuten, dass ein fortschreitender tuberkulöser Zerstörungsprozess in den Nieren vorliegt, sollte die Operation nicht hinausgeschoben werden, weil in vielen derartigen Fällen die Nierenresektion eine endgültige Heilung herbeiführen kann.

RIASSUNTO

Quando si esamini lo stato attuale della cura chirurgica della tubercolosi renale ci si rende conto che non solo sono cambiate le lesioni ma anche gli interventi chirurgici necessari. Interventi radicali e conservativi, che un tempo non erano permessi, ora sono possibili e vengono eseguiti con successo grazie alla protezione dei nuovi farmaci. Con gli antibiotici si ottiene che pazienti febbrili, intossicati, infetti, in gravi condizioni, migliorino a tal punto da consentire l'intervento necessario con tutta si curezza; divengono possibili anche gli interventi conservativi per pre-

venire le complicazioni e assicurare il miglior scarico. E poichè molti malati, fino ad ora giudicati inoperabili, possono essere sottoposti ad intervento chirurgico, molti di quelli che sarebbero morti oggi vivono. Gli antibiotici ed i chemioterapici hanno consentito di curare e guarire un gran numero di forme tubercolari precoci del polmone, di quelle che sono responsabili della secondaria infezione renale. Il BCG sta entrando nell'uso corrente cosicchè si può sperare che il numero dei casi di tubercolosi d i m i n u i s c a ancora, così da ridurre, di conseguenza, anche i casi di tubercolosi renale.

Non bisogna esagerare il rischio di riporre eccessiva fiducia negli antibiotici e nei chemioterapici. La rapida scomparsa dei sintomi e del bacillo dall'urina spesso induce un senso di falsa sicurezza; ma anche se il paziente può apparire guarito, possono persistere dei focolai latenti di malattia che possono riaccendersi sopo mesi od anche anni. Il paziente deve essere istruito sullá necessità imprescindibile di continuare la cura me dica per almeno 6 mesi o un anno dopo l'intervento e di ripresentarsi immediatamente alla visita non appena compaiono segni anche minimi i recidiva. Se, in questa occasione, gli esami dimostreranno che la funzione renale non è perfetta e che persistono segni urinarii, e l'urografia e la cistoscopia indicheranno che il processo distruttivo persiste, si dovrà ricorrere all'intervento perchè, in casi simili, la nefrectomia può portare alla guarigione definitiva.

RESUMEN

Revisando el estado actual del tratamiento quirúrgico de la tuberculosis en relación al progreso médico, se confronta con un cambio completo no únicamente en la patología sino en el tipo de la intervención quirúrgica indicada. Las operaciones conservadoras y radicales que antes no—podían efectuarse se hacen actualmente con éxito, con buenos resultados y bajo la protección de nuevas drogas y antibióticos. Baja la influencia de estos últimos, se mejora el estado de los pacientes infectados e intoxicados, para cualquier procedimiento quirúrgico. Las operaciones conservadoras previenen las complicaciones y aseguran la mejor canalización posible. Ya que los pacientes antiguamente inoperables, son operables, numerosos pacientes con tuberculosis del riñón que hubieran muerto, viven actualmente. Los antibióticos y quimioterápicos han dado la curación a gran número de pacientes con tuberculosis pulmonar temprana, lo que es responsable de una complicación renal mayor. La vacuna BCG se ha hecho más popular como preventiva de la tuberculosis pulmonar, lo que sugiere que cierto número de casos de tuberculosis pulmonar se han hecho más lentos, dando como secuela tuberculosis renal.

El peligro del abuso de los antibióticos y quimoterápicos no puede señalarse suficientemente; frecuentemente se obtiene un falso sentido de seguridad por la desaparición rápida de los síntomas y delbacilo tuberculoso de la orina; aún cuando el paciente parezca curado pueden persistir focos latentes que pueden volverse activos algunos meses o años después. Debe decirse al paciente la importancia vital de continuar el tratamiento médico al menos seis meses a un año después de la operación; debe volver para controles urológicos y urográficos al presentar el menor síntoma de recidiva. Si se hacedicho examen seguido de tratamiento médico antes y después de la operación y se encuentra que la función renal disminuye y los síntomas urinarios persisten, y si los datos urográficos y cistoscópicos indican que el proceso tuberculoso renal continúa preogresando, no debe demorarse la operación, en muchos casos la nefrectomía proporciona la cura permanente.

SUMARIO

Ao se rever o estado atual do tratamento cirúrgico da tuberculose, conforme influenciado pelas recentes aquisições médicas, confronta-se com uma mudança completa não apenas nas condições patológicas do tracto urinário a ser corrigidas, como também no tipo de intervenção cirúrgica indicada. Tanto as operações conservadoras como radicais que não podiam ser tentadas primitivamente são agora possíveis e executadas com sucesso, sob a proteção conferida pelas novas drogas e antibióticos. Sob sua influência os pacientes intoxicados, infectados e febrís que apresentam grave risco para qualquer intervenção cirúrgica, melhoram a tal ponto que as operações necessárias podem ser executadas com mais segurança. Ainda mais, é possível a operação conservadora para evitar complicações e assegurar melhor drenagem. Visto que muitos pacientes até então inoperáveis foram levados à categoria de operáveis, numerosos pacientes com tuberculose renal, que teriam morrido, estão vivos hoje. Os antibióticos e a quimoterapia conduziram grande número de pacientes com tuberculose pulmonar inicial à cura, sendo aquêle responsável pelo comprometimento dos rins em grau de proporção de casos de tuberculose renal. A vacina BCG está ganhando popularidade cresente como preventivo da tuberculose pulmonar, sugerindo assim que o número de casos de tuberculose pulmonar tornar-se-á progressivamente menor e igualmente, portanto, a tuberculose renal, uma de suas sequelas, tornar-se-á menos freqüente.

O perigo de se apoiar demasiadamente no auxílio dado pelos antibióticos e quimoterapicos não deve ser esquecido. O rápido desaparecimento dos sintomas e dos bacilos na urina freqüentemente dão uma falsa segurança. Mesmo quando o paciente parece curado podem persistir focos latentes da moléstia, que podem se ativar meses ou anos mais tarde. Os pacientes devem ser avisados quanto à importância vital da continuação do tratamento médico durante pelo menos 6 meses a um ano após a operação e devem voltar a completa revisão urológica e urográfica desde que haja o menor reaparecimento de sintomas. Se, em tal exame após tratamento médico anterior ou posterior à operação, verificar-se que a função renal está diminuida e os sintomas urinários persistem e se os dados urográficos e cistoscópicos indicam que o processo destrutivo tuberculoso dos rins progride, a operação não deve ser adiada, porque em muitos dêsses casos a nefrectomia pode trazer uma permanente cura.

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Medicolegal Aspects of Carcinoma of the Urinary Tract

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THE role of trauma in the production of cancer has always been a moot subject. Too many "traumatic cancers" have recently appeared in medicolegal literature, despite the fact that there is no association between a single trauma and the development of cancer. The relation of trauma and cancer in most litigated cases has been overshadowed by the importance placed on the theory that aggravation of an existing tumor may occur as a result of trauma.

The industrial specialist, like the industrial physician, is well aware that the average person is prone to blame his present affliction upon an alleged accident or so-called occupational disease. No matter how intelligently one may approach the problem, there is often great difficulty in determining just what is to be regarded as cause and what may be attributed to mere coincidence. The differentiation becomes even more difficult because of the fact that deeply embedded in human thinking is the habit of drawing false conclusions, a habit well described by the Latin phrase *post hoc; ergo propter hoc* (after it; therefore because of it). This is so especially with regard to the causal relationship of a tumor and trauma, in which the patient was not aware of having a tumor prior to the alleged injury.

Once it is established that an accident has occurred "as a result of" or "arising out of" employment, it becomes necessary to consider whether the accident, injury or disease would have happened to the patient on the street, at home or anywhere outside his occupational environment. In other words, a *causal relation* must be established or ruled out. To evaluate causal relationship properly, it is well to bear in mind that the question of causation automatically arises when, as a result of the claimant's testimony, he alleges that the accident or exposure caused the present affliction and complaint. He also claims that prior to the alleged injury, he had no symptoms nor had he any disease process. Obviously, in a case of cancer, the injured person honestly believes that it would be impossible for the disease to have existed prior to the alleged accident or injury.

Frequently in attempting to evaluate causal relationship the decision is influenced by one of the tenets of the law, *In dubio pro laeso*, which means "In doubt, always favor the injured." This attitude is unjust and in no way aids in the solution of this universal problem. It is not fair for any verdict to be given on a basis of sympathy, and such a decision should never be tolerated.

To evaluate the causal relation of trauma to a malignant tumor claimed to be associated therewith, certain postulates must be fulfilled. No possible relation of injury to the development of cancer can be fulfilled in any hypothetical case without such an evaluation. The following criteria have been established for evaluating the possible relation of an injury to the development of cancer:

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1. *Authenticity and Adequacy of the Trauma.*—This means actual proof of the injury, and for legal purposes there should be demonstrable evidence, such as a bruise, a swelling or an actual laceration. Although the statement of the patient is usually accepted in court, it is well to question him as to whether or not professional treatment was given and, if so, when, in respect to the time of the accident. It is best to rely upon the results of the first medical examination for this information, at which time a careful investigation should have been made of the circumstances of the injury, the terrain, the objects alleged to have been concerned, the exact sequence of events, and the question whether the incidents described could have occurred or resulted in the alleged injury.

In all reported cases of trauma it is important to determine whether the trauma was sufficient to produce some alteration in the structure of the tissue, for the least effect it can have is rupture of small blood vessels, with subsequent extravasation and discoloration of the skin. The character of the wound, as well as the type of instrument producing it, is important; for a clean, well-healed incision would theoretically be less hazardous than a bruised, irregular, jagged, suppurative laceration or a hematoma under constant pressure. When foreign bodies or irritating chemicals, such as acids, tar (cancer of scrotum) and wood are carried in a wound, healing is delayed, and atypical and unexpected results are prone to occur. There are many reports of cancers of the skin following such accidents, and it is well always to inquire whether the patient has been exposed to tar or other petroleum products.

2. *Previous Integrity of the Wounded Part.* — Proof of the previous integrity of the site or wounded part, as indicated by a competent medical examination prior to the date of the alleged injury, is important. If this is not available, courts and juries usually accept the patient's statement that the injured tissue was formerly entirely normal, but the positive demonstration that a tumor was caused by trauma requires proof rather than assumption. The patient, in his honest ignorance, may not have been aware of any preexisting lesion. With the occurrence of an injury—even a mild one and only temporarily disabling — combined with the ultimate recognition of such a serious disease as cancer, it is only natural that the injured person should state truthfully that he was well before the accident and has been continuously ill since it occurred.

Assuming that there is no deliberate attempt at deception, it is well to keep in mind that tumors are often present for years before they are recognized. Further, even though the injured person was examined at the time of the alleged injury without a tumor's having been detected, the possibility of its having been present cannot be excluded. Of even greater significance is the fact that certain tumors are prone to remain latent and unrecognized. In fact, the primary site of such a tumor can often be determined only by postmortem examination. This is especially true of tumors (carcinoma) of the thyroid, the male breast, the prostate, the kidney and the testicle. Such tumors metastasize in a bizarre fashion, remote from the primary growth, and frequently involve the skeleton. I have observed several cases in which metastases from such tumors were erroneously accepted as a primary growth and, combined with a history of superimposed trauma, confused the issue and made it difficult to determine whether the tumor had been present before the alleged injury or developed as a result of the injury.

It has often been noted that a person with a silent or unnoticed tumor (especially a testicular tumor) seems more liable to injury at the tumor site. In addi-

tion to the tendency of injuries to occur in the tumor-bearing area, there seems to be intensification of the subjective symptoms and local effects of the injury. Such tumors, e. g., tumors of the testicle, produce such local conditions as increased bulk, fixation in the organ, adherence to the skin and deep structures, and often some inflammatory reaction. Under these circumstances a simple blow, twist or pressure is often capable of injuring the tissues and causing pain and hemorrhage, whereas under normal circumstances the effect of the same simple blow, twist or pressure on normal tissues would have been *nil*. This predisposition is called "traumatic determination." Ewing once said, "Traumas reveal more malignant tumors than they cause." Pack described this phenomenon as "a strange paradox that injury to a part of the body containing an unknown tumor may be an accident beneficial to the patient, as it sometimes leads to the discovery of the tumor at a time when cure is still possible." *Because of such phenomena, it is always well to remember that whenever an apparently trivial injury is said to have produced some peculiar and exaggerated effect, and a tumor is later discovered, the tumor probably antedated the injury.*

3. *Origin of Tumor at Exact Point of Injury.* — Before any reasonable theory, however reasonable, of the traumatic origin of a tumor can be accepted, the tumor must be proved to have arisen at the point of injury. On this assumption, it follows that the tumor developed in tissues altered in structure by the trauma. Such alteration in normal architecture occurs only at the exact point of injury or within narrow limits.

Although proof that a diseased condition has been made worse by a mechanical injury has been accepted as sufficient cause for compensation, it does not follow that growth of a tumor can be accelerated or aggravated by the mechanical violence of a single trauma. The law requires that proof be presented to show that the injury resulted in premature disability or death. Too often it is contended that if no injury had taken place the tumor might have undergone spontaneous resolution and cure. This is pure speculation. As has been pointed out, the injury is actually a beneficial thing, for (1) it draws attention to the tumor, and (2) treatment is started sooner than if there had been no accident or trauma.

4. *Reasonable Time Lapse Between Injury and Appearance of the Tumor.*—This is actually an estimate of the amount of time elapsing between the date of the injury and the appearance of the tumor. This should be compatible with a causal relation. No one can deny that it is difficult to establish any definite limits of time within which a tumor may be reasonably said to be due to trauma. All are agreed, however, that the type of tumor may be the determining factor in deciding whether it could have developed within a certain period. The latent period should be neither too short nor too long, and the longer the interval the less certainly may the tumor be attributed to the trauma. Pack reported the case history of "a child whose abdomen was run over by a light horse-drawn vehicle. On admission to the hospital, persistent hematuria was diagnosed as due to a ruptured kidney. At operation a Wilms embryonal adenomyosarcoma was found and removed. Had the hematuria occurred six to eight weeks after the injury," stated Pack, "and the tumor discovered then, the etiologic postulates would have been fulfilled and judgment probably rendered in favor of the injured party."

5. *Positive Diagnosis of Presence and Type of Tumor.*—This criterion is obvious, yet microscopic examination will often reveal that what was thought to be a neoplasm is really tuberculosis or syphilis, or perhaps lymphogranuloma or some form

of metastatic cancer. Further, microscopic analysis may reveal the tumor to be a slow-growing process, the genesis of which antedates the injury. A decision regarding a neoplastic growth can only be made on careful microscopic examination.

The aforementioned criteria or postulates are the basic factors in establishing and assessing the possible responsibility of an injury for the development of cancer. Yet frequently, as a result of an inadequate history, inadequate medical records, faulty examination, faulty microscopic interpretation or illogical evaluation of causal relations, a neoplastic disease may be interpreted as causally related to trauma. This is well demonstrated in the following case, which could easily have been interpreted as meeting all the requirements here postulated and erroneously interpreted as causally related to the alleged injury:

REPORT OF CASE

A 21-year-old white man was referred to me because of pain and swelling in the left testicle. He worked for an electric power company, and he stated that, as he approached a home in which the meter was to be read, a collie darted out from the house and jumped up at him, striking his left testicle. The testicle became swollen, hard and painful, and there was a progressive increase in pain. He consulted his physician, who made a diagnosis of traumatic epididymo-orchitis. He was subsequently referred to me.

At this time, careful questioning revealed the fact that one year prior to the date of the alleged injury the patient had been examined for induction into the Army. He had been classified 4-F on a basis of a tumor of the left testicle. He had been told by the examining physician to consult his physician. Unfortunately he ignored the advice, since there had been no pain or discomfort. A diagnosis of tumor of the left testicle was made, and exploration of the scrotal sac revealed a tumor mass subsequently diagnosed as embryonal carcinoma.

In this case many of the original postulates already mentioned were well established. The one important postulate, however, namely the previous integrity of the injured part, was determined, by means of a careful history, not to have been normal prior to the date of the accident. Had this history not been obtained and had the trauma been accepted as causally related to the tumor, no explanation could have been given other than origin of the tumor at the site of injury. There was, however, one fallacy; the time between the injury and the appearance of the tumor was too short to account for the pathologic process.

My opinion is that, as was pointed out by Mock and Ellis, in any case in which cancer is claimed to have been caused by an accidental injury or trauma, the following postulates be answered: (1) a definite description by the reporting surgeon of the trauma at the time it was sustained; (2) definite proof, by every possible means of examination at the time the injury was sustained, that no tumor already existed at the site of the trauma, and (3) definite signs and symptoms of a pathologic process continuing at the site of the trauma until a malignant tumor appeared and was positively diagnosed.

Aggravation of a tumor by trauma is always a much discussed subject in compensation cases. The granting of an award in such instances seems reasonable when there is no doubt that the trauma accelerates the pathologic process, or when certain complications have arisen that would not have occurred in the progress of the disease had not the alleged injury been sustained. At no time was the law intended to protect or insure workers against cancer that is not the result of causes in his occupational environment. Yet the factor of aggravation constantly confuses the issue, in cases of cancer as well as of other diseases. For this reason it is well to be familiar with exactly what is meant by aggravation. Ewing stated that aggravation exists when "an injury hastens the

death of a patient . . . but when, however, the trauma merely leads somewhat prematurely to complications which are inevitable in the course of the disease and which are about to occur in the normal course, it seems inequitable to assume that any aggravation has occurred . . . unless the trauma introduces into the course of the disease something which does not belong there and which works to the disadvantage of the patient, aggravation may not properly be assumed."

SUMMARY

The author offers postulates which he hopes will help to evaluate the role of trauma in neoplastic disease. In all cases of trauma, careful study is indicated in order to establish, as far as possible, a causative relation to the occupational environment.

RÉSUMÉ

L'auteur établi des règlesqui devaient, (comme il espère) aider a l'evaluation de l'origine traumatique du cancer. Dans touts les cas d'un traumatisme des recherches exactes sont indiquées, pour etablir aussi bien que possible une relation causative entre la maladie et le milieu professionnel du patient.

ZUSAMMENFASSUNG

Der Verfasser macht Vorschläge, die zur Abschätzung der Bedeutung von Verletzungen bei neoplastischen Erkrankungen beitragen sollen. In allen Fällen von Verletzungen ist eine sorgfältige Untersuchung notwendig, um so weit wie möglich die ursächlichen Beziehungen zum Arbeitsmilieu festzustellen.

RIASSUNTO

L'autore espone degli elementi con i quali si può valutare l'importanza del trauma nella genesi dei tumori. In ogni caso di tumore è necessario uno studio accurato, diretto a stabilire eventuali rapporti causali con l'ambiente di lavorro.

RESUMEN

El autor presenta postulados que considera ayudarán a valorizar el papel del trauma en la enfermedad neoplásica. En todos los casos de trauma se encuentra indicado un estudio cuidadoso con el objeto de establecer, hasta donde sea posible, la relación causal del factor ocupacional.

It is the studying that you do after your school days that really counts. Otherwise you know only that which everyone else knows.

—*Doherty*

Obligations in the Consideration of Meloplasties

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THE art and practice of plastic surgery should, by this time, have reached a stage in which it can now stand on its own merits and make no apologies for its existence as a specialty. Yet there remain Puritans in the profession whose opinion is that the healing art should never be associated with beautification. These same dissenters will spend many extra hours in placing fine sutures, using small hooks instead of heavy-toothed forceps, and other atraumatic technics, to obtain a fine scar when, so far as healing goes, less delicate measures could be employed. The fear of criticism by contemporary authors, departmental heads and editors of various journals has prevented much discussion and publication of many articles on cosmetic surgery.

The increased interest and the justice of the demand made by those who refuse to tolerate disfigurement from age lines and wrinkles at a time in their lives when they can afford some of the luxuries denied them in earlier years places obligations directly upon the surgeon to consider their problems, as well as those of patients whose unsightly features may arise from other causes. Those who consider themselves above beautification in any form may find that there is no great dissimilarity between the one and the other and that the patients in the two categories are equally grateful.

Cosmetic metoplasty cannot be justified by pure vanity alone. It must have its place, however, in the busy practice of the plastic surgeon; otherwise patients will seek the services of the sympathetic charlatan, whose sole claim to specialization and training usually is his license to practice. Every resident or preceptee should have a proper foundation in this field. This end may be met in a lesser degree by a thorough understanding of the technic of multiple excisions as advocated by Dr. Ferris Smith, but he should also have the advantage of further training in cosmetic meloplasty.

Selection of Cases. — Each case should be judged thoroughly upon its merits. Vanity alone should be critically demarcated from social or economic obligations. The psychic factors involved should be carefully weighed, estimated and observed, lest the repercussions be detrimental rather than beneficial. Too much must not be promised, and a frank discussion of the probable recurrence of the condition should be held, with explanation of the reasons. Nothing can prevent loss of the elasticity of the skin and scalp and gradual recurrence of the redundant tissue. The older the patient, the more startling the result will be, but, also, the less lasting. Deeply crossed lines, or those of extreme age, are those in which the elastic fibers have lost their tone and will quickly recur and, when observed in examination, should be pointed out to the patient and explained.

The ability of the patient to withstand the lengthy procedure should govern the surgeon's judgment in his selection of

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cases. The greater the understanding established prior to the operation, the less misunderstanding there will be afterward.

Anatomic considerations are important from the standpoint of both the surgeon and the patient. The skin texture should be carefully scrutinized from the standpoint of thickness, mobility, previous irradiation or "peeling," tension lines, familial characteristics, assymetry, former scarification and hair-bearing areas.

The direction of "pull" should be watched vigilantly in order to prevent any distortion of the mouth or eyelids or displacement of the normal hair-bearing areas; the problem of the submental fat pad must be solved and the amount of undercutting necessary to produce the desired result estimated.

Preoperative Preparation.—First of all, this type of operation, properly done, must never be considered an office procedure. Its accomplishment demands the utmost care in planning, technic and understanding of the problems involved. The same preoperative care must be given as for any other major surgical procedure.

On the day before the operation the patient is advised to have a thorough shampoo with soap and water, with no attempt made toward style, curling or other means of beautification. Rinses and dyes are to be avoided.

Preoperative medication consists of morphine, gr. ¼, with scopolanine, gr. 1/150. The patient should be relaxed and drowsy when brought to the operating room. The entire face, scalp and neck are thoroughly scrubbed with phisoderm for at least six minutes, just prior to the operation. The skin and hair are dried with sterile towels and the entire area carefully draped.

The next step is marking out the previously planned areas, using Berwick's dye, brilliant green or other marking material. These marks should include the incisional lines and should be equalized on the two sides, in order that the finished product may not be distorted. The normal lines of the face and neck should be clearly marked in order that the flaps, when advanced, may be so placed that these lines may retain their position. Stretching small elevated areas without proper undercutting and advancement is to be condemned, and the limit of the deformity must be reached if a long-lasting and satisfactory result is to be obtained.

Procaine with epinephrine is the anesthetic of choice, and no closure should be made until an entirely dry field is obtained. This prevents hematoma, diffuse swelling and displacement of flaps.

The incision begins at the top and in front of the helix, curves slightly around the rim and thence proceeds downward, following the natural lines (some authors advise going posterior to the helix to the bottom of the external auditory meatus and thence outward and downward) around and under the lobe, thence upward and backward behind the ear to a level with the upper border of the tragus, across the postauricular area and thence downward into the hairline, where the scar will be concealed.

The upper part of the incision is carried around the hair-bearing area in front of the ear and curves upward into the temporal area of hair-bearing skin, in order to avoid unsightly bald spots and unsightly scars.

The tissues are undercut at the proper level for avoidance of both the fifth and the seventh nerve branches. The skin is elevated completely except around the angles of the mouth, where the fifth and seventh nerves emerge superficially. The neck is treated likewise. The most difficult part of the dissection is freeing the skin from the sternomastoid muscle, whose fibers are attached. This includes the area posterior to the muscle, if there is any re-

dundant tissue at this point. When this large flap has been completely freed from attachments, traction is made in an upward and backward direction until the overlapping may be marked out at the front and back of the ear without producing distortion around the mouth and nose, which may destroy the natural facial expression. After the excess has been trimmed, anchor sutures are placed at the top of the ear, beneath the lobe, behind the ear and in the curved temporal area. The lobe is corrected so that the scar is concealed beneath, and the wounds are closed subcutaneously with No. 0000 plain catgut and at the skin level with No. 00000 dermalon in front of the ear and 36-gauge wire elsewhere, if desired. Other means of closure are permissible at the discretion of the surgeon.

The double chin (or fat pad) is treated by making a small incision (about 1 cm. long) beneath the chin, curetting out the fat, which is easily extruded, and the skin traction will take care of the redundancy.

Hooding of the upper eyelids and correction of wrinkles (crow's feet) about the lower lids are done as a separate procedure and vary according to the deformity.

Postoperative Care. — This consists of moderate pressure bandaging with fluffs and brain rolls, so that the flaps are held in their new position and in close contact with the underlying raw areas, to prevent edema and serum collection. The usual postoperative orders are carried out.

The sutures in front of the ear are removed early, and the incisional area is covered with fine mesh gauze dipped in collodion. The sutures in the temporal region and the hairline are left for ten days to insure healing and to prevent spreading of the scars.

The patient is allowed to wash the hair on the twelfth postoperative day and to have a soap shampoo on the fifteenth.

Face cream, gently patted into the tissues, is allowed as soon as the edema subsides and may be augmented by carefully applying iced gauze to the face afterward to remove the cream. The suture line is not included. This is kept dry, and all crusts and scabs are removed gradually. Careful massage with oil is instituted when complete healing has taken place.

To be assured of success, one must avoid making the skin flaps of varying thickness. The elevated skin should be dissected completely free from the underlying tissues, so that it may be moved "en masse" to its new position without excess tension. Slight overcorrection is better than too little; one should allow for a certain degree of relaxation from the scalp.

Undercutting around the commissures of the mouth must be avoided, as must the superficial nerves crossing the anterior surface of the sternomastoid. An atraumatic technic should be rigidly followed. Some slight secondary corrections may be necessary.

SUMMARY

The author establishes the need for a better understanding of the increasing interest in cosmetic meloplasty and the training for its use by specialists. Fear of criticism by colleagues and others has created a barrier to the dissemination of knowledge and exchange of ideas by certified surgeons.

The patient who seeks this type of service too often is turned away with the admonition to "grow old gracefully." Usually these patients find sympathy and understanding in the charlatans, whose entire competence lies in the fact that they have licenses to practice. The result is further misunderstanding, and the doctor-patient relation is disturbed, whether the patient obtains good, bad or indifferent services.

Stressing the importance in the selec-

tion of cases, the anatomic considerations and the preoperative and postoperative care, the author points out some of the pitfalls to be avoided and outlines a plan for the operative procedure which has proved its value over many years.

RÉSUMÉ

L'auteur met au point la nécessité d'une meilleure entente dans l'intérêt croissant pour la méloplastique cosmétique et l'entrainement des spécialistes dans son usage. Une peur de criticiame par des collègues et d'autres gans a crée une barrière contre la dissémination de la connaissance et de l'échange d'idées par les chirurgiens certifiés.

Le patient qui cherche cette sorte de traitement est trop souvent renvoyé avec la remarque "de vieillir avec grace." En général ces patients trouvent de la sympathie et de l'interêt chez les charlatans, qui sont compétents seulement, qu'ils ont un permis de pratiquer. Le résultat est plus de malentendu et la rélation entre docteur et malade est dérangée, soit que le tratement etait bon, mauvais ou indifferent.

L'auteur en accentuant l'importance de la sélection des cas, les considérations anatomiques et le soin pré-et postopératif, explique, comment quelques insuccès peuvent être évités et construit un plan de la procédure opérative, qui a prouvé sa valeur pendant beaucoup d'années.

ZUSAMMENFASSUNG

Der Verfasser weist auf die Notwendigkeit grösseren Verständnisses für das wachsende Interesse an kosmetischer Wangenplastik und auf die Wichtigkeit spezialistischer Ausbildung zur Ausführung der Operation hin. Aus Furcht vor der Kritik seitens der Kollegen und anderer sind Schwierigkeiten enstanden, die einer Verbreitung der Kenntnisse auf diesem Gebiet und dem Gedankenaustausch unter anerkannten Chirurgen im Wege stehen.

Allzu oft werden Patienten, die eine derartige chirurgische Hilfe suchen, mit dem Rat "in Würde alt zu werden," nachhause geschickt. Sie finden dann gewöhnlich Mitgefühl und Verständnis bei Scharlatanen, die ausser ihrer ärztlichen Approbation keinerlei Qualifikationen besitzen. Dies führt zu weiteren Missverständnissen und Störungen der Beziehung zwischen Arzt und Patienten, gleichgültig ob der Patient nun gute, schlechte oder indifferente Behandlung erfährt.

Der Verfasser betont die Wichtigkeit sorgfältiger Auswahl der Fälle und weist auf anatomische Gesichtspunkte und auf die Bedeutung präventiver und postoperativer Massnahmen hin. Er macht ferner auf gewisse Gefahren der Operation aufmerksam, die vermieden werden müssen, und entwirft einen Plan des chirurgischen Vorgehens, der sich ihm viele Jahre lang als wertvoll erwiesen hat.

RIASSUNTO

L'autore auspica una maggior comprensione nei confronti della meloplastica cosmetica e si augura che il problema venga affrontato da specialisti. Il timore di critiche da parte dei colleghi o di estranei ha creato molte difficoltà in questo campo; i pazienti che intendono servirsi di questo mezzo di cura troppo spesso vengono scoraggiati e trovano comprensione soltanto da parte di empirici la cui unica competenza è rappresentata dall'autorizzazione ad esercitare. Il risultato è l'incomprensione e un ulteriore peggioramento dei rapporti fra malato e medico.

L'opportuna scelta dei casi, le studio anatomico, le cure pre- e postoperatorie, la conoscenza degli errori da evitare, e un piano chirurgico prestabilito possono portare a buoni risultati.

RESUMEN

El autor señala la necesidad de un mejor entendimiento y mayor interés en la meloplastia cosmética, así como un entrenamiento para su uso por especialistas. El temor a la crítica por colegas y por otras personas ha creado una barrera a la diseminación del conocimiento y al intercambio de ideas por cirujanos reconocidos.

El paciente que busca este tipo de servicio frecuentemente es rechazado. Generalmente estos pacientes encuentran simpatía y comprensión en los charlatanes cuya competencia reside en el hecho de que poseen una licencia para ejercer. El resultado es una mayor confusión que produce una perturbación mayor de la relación doctor-paciente, independientemente de que el paciente reciba un servicio bueno, malo o indiferente.

Señalando la importancia de la selección de los casos, las consideraciones anatómicas y el cuidado preventivo y postoperatorio, el autor trata algunos de los factores de fracaso que deben ser evitados, delineando un plan para el procedimiento operatorio que durante muchos años ha mostrado ser de valor.

. . . Once and for all the truth is best. The truth does not ultimately harm. The truth is healing when accepted, deep down, and the truth is that the world was not made to be an easy place to live in. There are some, many, no one knows how many, who are healthy, and a great many appear so who are not. But there are others who carry some horrible disease, some bodily affliction, about with them. What shall they do? Shall they gird at the healthy? There are some who have happy households, and others who endure the misery of perpetual strains between the housemates. There are some who have unbroken ties, and others who are bereft, afflicted. We ought to try to conquer disease, and to make homes happier, to make homes more harmonious, to postpone death. But in the meantime there are those who have to suffer, who have to bear what seems intolerable, and yet can be made tolerable. And is it not true also that when you look upon the people of this country you will see that the great majority of them have to struggle for their very existence, and that wealth is unequally divided, and you admit that it ought not to be so? And yet you warn, and rightly warn, against revolt. You say that the greater number of mankind must be patient until the social order can be changed. It ought to be changed, but in the meantime they ought to be patient. And shall we not also endure patiently such injustice as may fall to our lot, and bear our share of that world suffering which in one form or another, material or spiritual, is the price to be paid for world redemption?

—*Adler*

The Present Status of the Treatment of Peptic Ulcer

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SIMULTANEOUSLY with the development of the fundamental knowledge of the gross pathologic picture and pathogenesis of the ulcer lesion in connection with clinical signs, clinicians and pathologists alike were theorizing as to the etilologic factors. Thus Virchow in 1853 offered the earliest plausible hypothesis as to the cause, beyond obscure references to the acid factor. His theory was that the ulcer process "results from the plugging of the nutrient artery of the part by embolus or thrombus, and the infarct so produced is destroyed by the digestive action of the gastric juices."

In the absence of a clear concept of the nature of the ulcer process, treatment was chaotic. In fact, a medical treatment scarcely could be said to have existed until after the beginning of the era of surgery which gave impetus to the study and knowledge of the disease. Up to that time, treatment was largely symptomatic and directed toward "dyspepsia," "gastralgia," "gastrorrhagia," etc. Clinical differentiation between gallbladder disease, disease of the pancreas, ulcer and other diseases of the upper part of the abdomen could not be made with any degree of consistency. Actually, in addition to dyspepsia, the medical profession was dealing chiefly with such complications as hemorrhage, obstruction and perforation. The latter group of lesions obviously could be rationally attacked only by surgical means; thus, the possibilities of surgical treatment as initiated by the work of Billroth and his co-workers were hopefully hailed. Yet during the infancy of gastric surgery the postoperative complications, the recurrent operative morbidity and the operative mortality rates were frightfully high. The death rate for so simple a procedure as gastroenterostomy from 1881 to 1885 was recorded by Mayo-Robson as 65 per cent.

In the meanwhile, and to a large extent because of surgical shortcomings, noted gastrologists such as Kussmaul, von Leube, Ewald and Einhorn were developing nonsurgical methods. Lavage was emphasized, and there were heated controversies concerning its indications and contraindications, especially as to the danger of employing the stomach tube in the presence of bleeding or other signs of ulcer activation. With the principle of gastric rest, as exemplified by the substitution of rectal for oral feeding, the use of sedative drugs enjoyed quite a vogue. In the early 1930's Meulengracht published his new plan of treatment, contributing the principle of feeding during the active state of ulcer as opposed to the orthodox rest (starvation) principle. Although the Meulengracht methods were not universally accepted in all details, the principle involved materially influenced medical practice. Rest, as spoken of in this paragraph, is related to the idea of cessation of gastroduodenal function by depriving the organs of food to digest. Much of the reasoning with respect to it is fallacious. The medical man

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of today has a much broader concept of rest in relation to the ulcer patient, emphasis being placed upon the mental and emotional repose of the whole man rather than upon functional rest of the individual organ.

Thirty years ago, such discussions as "Medical vs. Surgical Treatment of Ulcer" were not infrequent in the medical world. Many will remember that a minority group of surgeons, led by the noted John B. Deaver in the United States and by Sir Berkeley Moynihan in England, held that peptic ulcer was a surgical disease in somewhat the same sense as appendicitis. On the other hand, many medical men were procrastinating in cases which properly demanded operation. This resulted in a needlessly high mortality rate.

It would be interesting to trace the modern development of surgical procedures. Briefly, it may be mentioned that after the Billroth era many gastric operations were devised. Some had good physiologic bases; others were quite irrational. Such procedures as sleeve resection, knife or cautery excision, the Devine resection and the Jaboulay gastroduodenostomy have largely been abandoned.

Etiologic Considerations. — By 1930-1940, clinicopathologic observation and physiologic experiment were combining to promote a better understanding of the "ulcer phenomenon" (Necheles), as a result of which certain rather generally accepted assumptions could be formulated:

I. *The predominance of excess acid gastric juice as a causative factor.* Although this had been dimly recognized by clinicians, perhaps for ages, it remained for B. W. Sippy of Chicago to prove by an unparalleled series of clinical observations that, once the influence of excess gastric secretion is neutralized or removed, peptic ulcers will heal. Today all methods of treatment are predicated on this basic concept. *Miscellaneous accessory factors* may be listed as follows:

1. Psychic influences. The effects of such influences on the digestive mechanism have been known to observant physicians from time immemorial. Pavlov's classic experiments on conditioned reflexes provided the first laboratory confirmation. Development of the knowledge of hormonal and cephalic phases of digestive activity has further clarified the question of central nervous influences. The psychoneurotic background and the evil effects upon the ulcer patient of emotional stress, as noted on clinical observation, are too well known to require elaboration.

2. Chronic fatigue.

3. Poor hygiene.

4. The use of tobacco.

5. Hypovitaminosis.

6. The use of alcohol.*

7. External physical trauma. Many authors have considered this a possible cause, but I have never encountered a case in which physical violence seemed to be an etiologic factor.

8. Extensive skin burns (Curling's ulcer). Such burns are known to be associated at times with duodenal ulcer, but they play an insignificant role in the causation of peptic ulcer as encountered in everyday practice.

9. A focus in the central nervous system (Cushing's ulcer). This was foreseen many years ago by Brown-Sequard, brilliant French-African philosopher-physiologist who discovered that he could produce ulcer in animals by destroying the corpora quadrigemina. This cause of ulcer is of academic rather than practical interest.

10. Adrenal influence. The theory of the late George W. Crile, concerning the adrenal influence, and his clinical series of suprarenal denervations on ulcer patients

*The two factors last mentioned play roles of varying significance in different patients.

may be remembered. His observations were not taken seriously by other clinical workers at the time. This phase of gastric physiopathology, however, is being revived, and a principle of therapy upon an adrenal physiologic basis is being studied.

11. Lowered tissue resistance. Meyer's (New York) work with lysozyme has not clarified this problem.

12. Ischemia of terminal arteries. The theory that this plays a part in the localization of ulcer has not been substantiated by anatomic studies.

II. *Geographic Distribution.* In the course of two recent winter tours in India, Pakistan and Ceylon, I was struck by the marked variation in the regional incidence of ulcer. In the larger clinics at Lahore it was relatively rare, although gallstones were common. The same was true, relatively speaking, at Delhi, Jaipur and Lucknow (North India). In South India (centering at Madras) the frequency of operations for ulcer was astoundingly high. The same is true in the Bengal Province, especially East Bengal. Ulcer is common in some parts of China. Years ago, Osler noted that the disease "is much less common in some countries than in others, and in some parts of this country." He continued, "It is certainly less frequently seen in Baltimore than in Massachusetts or in Canada" (Osler, Practice of Medicine, Fifth Edition, D. Appleton and Company, New York, 1902). Although the disease is universal as to occupation, race and site, there is significant variation in the geographic incidence. There is frequent reference to this in the literature, yet comprehensive and reliable statistical studies are not available. Careful investigation of this phase of the ulcer problem, correlated with the habits and diet and geologic character of the regions involved would help to throw light on the involved etiologic background of the disease.

III. *Finally, there is an X factor which eludes detection,* wherefore the basic cause of ulcer remains an unsolved problem.

IV. Corollary to what has been said, the natural tendency of all ulcers is to heal and failure to do so completely bespeaks the existence of an array of factors unfavorable to this outcome. With present methods it is generally accepted that 80 to 85 per cent of all ulcers may heal or be caused to heal without surgical intervention. The percentage of nonsurgical cures may be slightly increased by the use of new cholinergic drugs. There is a group of cases in which the condition is susceptible of relief under ideal conservative management, yet in which economic considerations dictate operation rather than long-drawn-out, imperfectly executed medical measures. There is another (not inconsiderable) group of cases in which neither operation nor medicine will provide a remedy unless elimination of emotional stress and frustration (and cigarette smoking) is possible.

Advances in Drug Therapy.—It is not within the scope of this paper to go into the details of the chemotherapeutic management of ulcer, yet the topic must not be disregarded, since research in this field is directed toward reducing the number of cases in which surgical intervention will be required.

Let us trace briefly the use of drugs in the treatment of this disease in the last one hundred years. The acid factor and the necessity for its neutralization were early recognized. Thus sodium bicarbonate, sodium sulfate and sodium mixtures (artificial Carlsbad salts) and bismuth salts in doses of 30 to 60 gr. three times a day were favorite remedies at the turn of the century. Many elderly practitioners are still employing the bismuth salts in the form of bismuth subnitrate or milk of bismuth, with confidence in its efficacy. Cerium oxalate was used extensively, and often the two were administered in com-

bination in so-called demulcent mixtures, with the idea of coating the active ulcer. Another favorite practice was the use of silver nitrate solutions. Medical men of a generation ago were still using acetate of lead, gallic acid and tannic acid in attempts to overcome ulcer bleeding by the local astringent properties of these drugs. Ergotine was used for this purpose for a time. The majority of careful observers have concluded that practically all of these remedies were ineffectual. Osler, as far back as 1902, in the Fifth Edition of his *Practice of Medicine,* made the following statement: "Medicinal measures are of little value in ulcer and the remedies applied do not probably benefit the ulcer, but the gastric catarrh." Naturally, relief of pain was a major consideration; hence, opiates were freely recommended, although caution against their abuse was learned early. The knowledge of the potent influence of antispasmodics in the reduction of pain has largely overcome the need for narcotics in all but acute emergencies. With the development in late years of the parenteral route for the introduction of therapeutic agents, a host of drugs and foreign protein substances have been administered by injection. Bacterial vaccines, autolysotes, milk proteins, pepsins and various hormones have all had a vogue, but by now they all have been practically abandoned. The use of antibiotics is rational in those cases in which infection is present. Such cases are represented by those with distant focal infection, or with slow penetration of the ulcer and the development of infected pockets (periduodenal or peripyloric abscess).

Drugs have always been more or less secondary to other measures, even to rest and diet. The new cholinergic drugs promise to accomplish some reduction in the number of cases demanding surgical treatment. In addition, studies are being made of pyrogen drugs that stimulate healing.

Before leaving the subject of nonsurgical treatment, it must be mentioned that roentgen rays have been used with benefit in certain cases (W. L. Palmer) as a means of reducing hyperchlorhydria. Despite highly rated sponsorship, the method has not gained general acceptance.

Vagotomy. — Dragstedt's announcement in 1943 that favorable results in peptic ulcer followed division of the vagus nerves opened a new vista in the surgical treatment of this disease. The procedure had been tried and abandoned by an earlier generation of surgeons. With admirable persistence, Dragstedt continued his experimental and clinical observations and became convinced of the efficiency of the method. Yet, despite the optimistic reports of Dragstedt and others, it is still a controversial procedure. It has not stood the test of time, although early results in certain cases are brilliant. Aside from the failures recorded against it, one of the chief handicaps is the characteristic postoperative triad of bloating, nausea and diarrhea in spite of an inlying nasogastric tube.

Operations for Peptic Ulcer.—At present the following operations are available to the surgeon in the treatment of peptic ulcer: vagotomy, gastrojejunostomy (or gastroduodenostomy) and subtotal gastrectomy. Around these basic procedures surgeons will never cease to improvise impromptu technics to meet individual circumstances.

Vagotomy unsupplemented has been practically abandoned. Most surgeons now add gastroenterostomy whenever vagotomy has been performed, thus mitigating some of the aforementioned untoward effects. As I have stated elsewhere, in addition to its corrective influence in connection with vagotomy, gastroenterostomy brings in an additional therapeutic factor, to which at least part of the credit must be given for benefits that follow the com-

bined procedures. Occasionally total gastrectomy has been done accidentally or on purpose for ulcer, a procedure which, of course, cannot be recommended. However, in 1 of my patients, whose case was reported elsewhere, total resection was done under the supposition that cancer existed, and the patient shows a favorable outcome after five years.

Dragstedt has recently reviewed the vagotomy question at the 1954 annual meeting of the Illinois State Medical Society at Chicago. Admitting that the present status of the operation is controversial, he said nevertheless that "vagotomy combined with gastroenterostomy has practically replaced subtotal gastrectomy in the treatment of duodenal ulcer" at the University of Chicago Clinics, of which he is the head. On the basis of an experience with 870 cases the mortality is one-tenth that of subtotal gastrectomy, and the percentage of failures is about the same. Dragstedt emphasized what is known to surgeons who have favored the employment of vagotomy in selected cases—that the nerves should be sectioned above the diaphragm, that is, supradiaphragmatically, but transabdominally. This is accomplished by making an incision in the diaphragm above the anterior rim of the hiatus, freeing the esophagus bluntly with the fingers and carefully drawing it 5 or 6 cm. into the abdomen. Maximal exposure is gained through a midline left paramedian incision, extending high in the epigastrium, with excision of the xiphoid cartilage (Saint) when necessary. Division of the vagus nerves at lower levels will usually be followed by incomplete operation, which accounts for many of the unsatisfactory results.

Substantially I have followed Dragstedt's teachings, and, though not as optimistic as he, I am of the opinion that vagotomy may be substituted for subtotal gastrectomy, in many cases of duodenal ulcer without major complications. It is often the procedure of choice for "poor risks." It is not used for gastric ulcer. High gastric acidity as determined by studies of night secretion is one of the practical criteria in the selection of vagotomy. Vagotomy is a relatively simple procedure in the hands of a skillful surgeon, but it is a fallacy to consider it a minor operation.

Phrenicovagal Interruption. — For the purpose of reducing the unpleasant postvagotomy symptoms and increasing the efficacy of vagotomy, I have suggested the addition of phrenic nerve crush (phrenemphraxis) to the operation. Phrenicovagal interruption is practiced and recommended for employment whenever vagotomy is deemed indicated. A full discussion of the indications for vagotomy in ulcer therapy is not within the scope of this paper, but a statement concerning its application appears in a later paragraph.

The idea of adding the phrenic procedure to vagotomy is based on an observation made by Jefferson and Phillips of this clinic: that when this nerve is cut simultaneously with vagotomy in dogs, the usual postoperative atony and distention do not occur. Phrenicovagal interruption has been applied to a small number of patients with duodenal ulcer, with the view of increasing the efficiency of vagotomy in suitable cases. All of the patients on whom vagotomy plus phrenic nerve crush has been performed have had unusually smooth convalescences. The procedure is undergoing further study.

The rationale of supplementary phrenic nerve crush is as follows: The temporary paralysis of the left side of the diaphragm, with its resultant ascension into the thorax produced by crushing its motor nerve, amplifies the intra-abdominal space required for the distended stomach after section of the vagus. Furthermore, the elevation of the gastric fundus permitted by the high-

lying left side of the diaphragm tends to make the stomach vertical and thus conduces to better drainage of this organ. Finally, relaxation of the phrenic musculature around the esophageal hiatus and relief of cardiospasm further contribute to mitigate the disagreeable effects of gastric dilatation. In my opinion, reduction of the vomiting reflex consequent upon phrenic interruption* also adds to the postoperative comfort of the patient.

Phrenic nerve crush in the left side of the neck is carried out by an assistant during the main procedure, thus entailing no increase in the total operating time. It is obvious that in a transthoracic vagotomy the phrenic nerve may be crushed with hemostatic clamps as it courses along the pleuropericardium.

Résumé of Surgical Indications.—Most duodenal ulcers (85 per cent) are "medical." Most gastric ulcers are "surgical." Many ulcers regarded as medically cured come late to surgery (perforation, reactivation, recurrence of bleeding). Most large gastric ulcers with deeply punched-out bases, ulcers that bleed, and ulcers that penetrate with periduodenal or perigastric pocketing are potentially or actually surgical, even though susceptible of relief by medical means. Likewise, of course, surgical failures come to medical treatment. However, the vast majority of surgical failures must come back to operation, and under modern conditions can be remedied by the surgeon experienced in this type of work.

Choice of Operation. — 1. Vagotomy is indicated for duodenal ulcer if, as usually is the case, the level of free hydrochloric acid in the gastric contents is high. If obstruction is present, supplementary gastrojejunostomy is obligatory.

2. Vagotomy is indicated for early anastomotic ulcers. It is contraindicated for chronic stomach ulcers.

3. In the treatment of some cases of ulcer, gastroenterostomy may be the better choice if the risk of gastric resection is deemed excessive. Gastroenterostomy should always be supplemented with vagotomy. As has been mentioned, the most striking benefits of gastroenterostomy are observed when it is applied for high-grade pyloric stenosis. Gastroenterostomy also serves a useful purpose when, in closing off perforating ulcers, there is doubt as to the patency of the pylorus.

4. High subtotal gastrectomy* remains the overall standard procedure for peptic ulcers that require surgical intervention. It is the operation of choice for gastric ulcer. It is often the best operation for complicated duodenal ulcer, but here it shares indications with vagotomy and gastroenterostomy, as has been mentioned. Three-fourths of the stomach must be removed. Resective procedures may be contraindicated because of poor risk, age, hypertension, cardiorenal disease or other serious conditions. Here a gastrojejunostomy may be the wise alternative, as has been mentioned in discussing the indications for that operation. With the safeguards now available, however, and with a well-practiced technic, it is only rarely that gastrectomy cannot be done with reasonable safety.

In certain instances, because of periduodenal adhesions, if it seems hazardous to include the pyloric ring in the removed specimen, a cuff of the pyloric wall may be left, from which the remnant of antral mucosa may be reamed out (Bancroft, Rothenbert). This is essentially a modification of the sleeve operation, now largely abandoned.

*A comprehensive study by the author of the phrenic nerve in its historical, physiologic and clinical aspects is in preparation. (See also, "La Phrenicectomie," Berard-Dumarest-Desjacques, Masson et Cie, Paris, 1933.)

*In this clinic most acute perforations are now treated by subtotal gastrectomy if encountered within eight hours.

SUMMARY

The author reviews the history of peptic ulcer as a clinical entity and discusses various etiologic theories, including the much-talked-of psychic influences. The geographical incidence of peptic ulcer is considered in this connection, but in the author's opinion the basic cause of the lesion is still unknown. Advances in drug therapy, an evaluation of vagotomy, and an exposition of the various surgical procedures in current use are included, and the indications for surgical intervention are summarized. Vagotomy, gastroenterostomy and high subtotal gastrectomy are to be considered in making the choice of an operative procedure.

ZUSAMMENFASSUNG

Der Verfasser gibt einen Überblick über die Geschichte des Magengeschwürs als klinische Einheit und erörtert die verschiedenen ätiologischen Theorien einschliesslich der vielbesprochenen seelischen Einflüsse. In diesem Zusammenhang wird auch die geographische Verteilung des Magengeschwürs in Betracht gezogen; der Verfasser glaubt jedoch, dass die tiefere Ursache der Erkrankung noch immer unbekannt ist. Die Arbeit geht auf die Fortschritte der medikamentöden Behandlung ein, gibt ein Urteil über den Wert der Vagotomie und stellt die verschiedenen heute zur Anwendung gelangenden chirurgischen Verfahren dar. Die Indikationen zum chirurgischen Eingriff werden zusammengefasst. Der Verfasser glaubt, dass die chirurgische Behandlung zwischen der Vagotomie, der Gastroenterostomie und der hohen subtotalen Magenresektion zu wählen hat.

RÉSUMÉ

L'auteur revoit l'histoire de l'ulcer peptique comme une unité clinique et discute les différentes théories étiologiques, inclu l'influence psychique souvent discutée. L'influance geographique de l'ulcer peptique est considéree en cette connection, mais dans l'opinion de l'auteur la cause basique de la lésion est encore inconnue. Les avances en thérapie médicale, une évaluation de la vagotomie et un exposé des procédures chirurgicales différentes, maintenant en usage, sont inclus et les indications pour l'intervention chirurgicale sont énumerées. Vagotomie, gastro-entérostomie et gastrectomie subtotale doivent être considerées en choisissant une procédure opérative.

RIASSUNTO

L'autore fa la storia dell'ulcera come entità clinica e ne discute le varie teorie etiologiche, sopratutto quella psichica. La distribuzione geografica dell'ulcera è un elemento di importanza, ma la causa vera del l'affezione è ancora sconosciuta. Vengono elencati i nuovi metodi di cura medica e chirurgica, con particolar riguardo alla vagotomia e ai metodi moderni di resezione. La scelta del metodo operatorio deve essere fatta fra la vagotomia, la gastro-enterostomia e la resezione sub-totale.

RESUMEN

El autor revisa la historia de la úlcera péptica como entidad clímica y discute las diversas teoríás etiológicas, incluyendo la tan mencionada influencia psíquica. En este sentido se considera la incidencia geográfica de la úlcera péptica; según la opinión del autor la causa básica de la lesión se desconoce. Se incluyen los progresos en la terapeútica médica, la valoración de la vagotomía y la exposición de los diversos procedimientos quirúrgicos que se usan comunmente. Se resumen las indicaciones para la intervención quirúrgica. Se consideran como métodos de elección en un

procedimiento quirúrgico la vagotomía, la gastroenteroanastomosis y la resección subtotal alta.

SUMARIO

O autor faz a revisão da história da úlcera péptica como entidade clínica e discute várias teorias etiológicas, inclusive a muito comentada influência psíquica. A incidência geográfica de úlcera péptica é considerada neste sentido, mas na opinião do autor a causa básica da lesão continua desconhecida. Os progressos no tratamento por drogas são apresentados resumidamente, bem como uma avaliação da vagotomia, uma exposição dos vários processos cirúrgicos de uso corrente e indicações para a intervenção cirúrgica. Na escolha do processo operatório devem ser consideradas a vagotomia, a gastroenterostomia e a gastrectomia sub-total.

Wayward chromosomes cause numberless comical results. They sometimes produce doubled legs on frogs and doubled feelers on insects. They have been known to sprinkle extra fins at random on fishes and to put a perfect right leg on the left side of a fowl. They may plant several extra spurs on a gamecock's leg, or wing-feathers on a leg, or membranes between the toes. A ram with a whole crowd of little horns on his head suggests that some chromosome was disordered and tried to do ten times too much. Sometimes it would appear that two chromosomes are tangled, with the result that an animal has one of its sides male and the other female.

Wayward chromosomes are sometimes beneficent, building better than their norm and producing an individual whose new characteristics are inherited by his descendants. In 1791, on a Massachusetts farm, was born a ram whose legs were so short and body so long that he was nicknamed the "otter"; he was valuable because he could not jump fences, and he became the founder of a new breed of sheep called the "ancon." Forty years later the same sort of thing happened on a farm in France. A ram was born with a large head, long neck and legs, covered with smooth silky wool; he was the forefather of a new and valuable kind of sheep. Such sudden creations, or "sports," are decided alterations that chromosomes make in the pattern they are supposed to follow—"happy mistakes" we might call them. Such a mistake certainly brought joy to a Kansas farmer in 1889, who one day found that a young calf in his herd of Hereford cattle had no horns; it founded the race of "polled Herefords."

These great variations in animals are celebrated because they were so useful to man and were as romantic as the discovery of a new diamond mine. Sports in plants have been more numerous. For one example, there was once a set of chromosomes in an orange that did not put in any seed-making apparatus, and that ornamented the base of their work with a queer whirl. An orange-grower noticed this sport and liked it; since then the "navel" orange has been on all our fruit stands.

—*Ward*

Ground Substance and Surgical Diseases of Connective Tissue

SIDNEY VERNON, M.D., F.A.C.S., F.I.C.S.

WILLIMANTIC, CONNECTICUT

CONNECTIVE tissue pervades the entire living body. The ground substance of connective tissue functions in a manner parallel to the function of plasma in the circulation. Ground substance, recently discovered to hold the key to urolithiasis; may also be involved in calcification of the supraspinatus tendon and the calcification associated with chronic relapsing pancreatitis. Other conditions, such as myositis ossificans, Volkman's contracture, frozen shoulder, radiohumeral bursitis and De Quervains disease may also be involved with ground substance..

Baker demonstrated that when kidney stones form the original locus of deposition is in the ground substance of the renal medulla. Thus the breakdown of calcium balance shows up in an area that has hitherto commanded little attention, the interstitial tissue. It suggests that ground substance may function importantly and may be the physiologic connector between the circulation and the cells. The interstitial space, comprising about 11 per cent of the body, is known to be important in fluid and electrolyte balance. Connective tissue is a part of all anatomic components, appearing as fasciae and ligaments near muscles, bones and tendons, adventitiae near blood vessels, and a supporting reticulum and fibrous structure in and about parenchymatous organs.

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Connective tissue consists of fibroblasts, fibers and ground substance. Ground substance is a hydrated gel and is abundant and continuous in the tissues of infants; in senile tissue it is at a minimum. The gelatinous content of a ganglion cyst may represent an abnormal accumulation of ground substance. Recent study of the collagen diseases has placed emphasis on the importance of the ground substance. Collagen diseases, as a group are responsive to ACTH and cortisone; they include rheumatic fever, rheumatoid arthritis, and disseminated lupus erythematosus, among others. In surgical conditions there may be failure of the ground substance to adapt itself to local tissue damage, whether mechanical or chemical. The function of the fibroblast and its components is more than structural; it has an everyday function of delivering to the cell the chemical components of the circulation. These components include hormones and corticosteroids; vitamins and other nutritional elements; oxygen; carbon dioxide, and ions of the body elements. In addition, it functions actively in repair. The massive response of tissue repair to gross injury of bone, tendon or other tissue indicates that the mesenchymal system has an active and continuous function. Quantitative control of this response is desirable, as in the case of massive plastic exudate response to tendon injury and repair.

Connective tissue fibers are collagenous, reticular and elastic; reticulum fibers stain with silver salts, while elastic fibers

require a special stain. Hyaluronic acid and chondroitin sulfate, observed in fibers and ground substance, are proteins known as mucopolysaccharides. Three other mucopolysaccharides have been demonstrated in varying amounts, depending on whether the tissue studied is cartilage or cornea, heart valves or tendons, vitreous humor or umbilical cord. In the presence of myxedema, a shift from hyaluronic acid to chondroitin sulfate produces more collagen.

Fibroblasts secrete mucopolysaccharides and also aid in formation of collagen fibers in the ground substance. Enzymes, vitamins and hormones also regulate the connective tissue. Enzymes that break down the mucopolysaccharides are the hyaluronidases, several varieties of which occur in man and nature. Antihyaluronidases (antienzymes) are heparin and antibodies derived from gamma globulin of the blood serum.

Vitamin C is needed by fibroblasts to form collagen and maintain phosphatase activity. Stress releases ascorbic acid from the adrenal glands, and both ascorbic acid and cortisone have five membered rings in their molecular structure. Vitamin E also must play a part in connective tissue conditions, as is shown by clinical experience; its empirical use in cases of Dupuytren's contracture and of chronic induration of the penis (Peyrones's disease) has relieved symptoms. Empiricism prevails because of the successes obtained by trial and error, but research should lead to surer methods of therapy.

Thyroidectomized guinea pigs acquire exophthalmos when given thyrotropic hormone, because ground substance increases in the retrobulbar tissues. Adrenal corticosteroids increase the rate of flow of electrolytes through the ground substance, just as hyaluronidase does; cortisone decreases it. The gamma globulins contain antibodies (or antienzymes) that resist pathologic change in the ground substance and appear to come from plasma cells.

Tissue calcification has been discovered to be related to the collagen diseases. Normally calcium and phosphorus blood levels are maintained in equilibrium, with absorption from the intestine, resorption from and deposition in bone and excretion by the bowel and kidney. Lowering the carbon dioxide tension precipitates calcium and phosphates, and in the lung, stomach and kidney the normal level of carbon dioxide tension is lower than elsewhere. Vitamin D and parathyroid hormone influence the blood concentration of these ions.

Osteoid tissue contains enzymes that release phosphate ions. The local increase raises the product of calcium and phosphate ions beyond the level of solubility, and precipitation of calcium phosphate occurs. Injured tissue helps to form the phosphate-releasing enzyme to increase the tendency toward calcification. The salt deposited in calcified areas is the same as the natural mineral apatite, and the particular apatite of bone is dahlite. Normal and pathologic calcium deposits are therefore similar in appearance. Calcification in the supraspinatus tendon may represent a failure of the tissue to adapt to local mechanical stress, the locus of defect being the ground substance. The supraspinatus muscle is subjected to multiple stresses, since there is a backward pull by the subscapularis muscle, a forward pull by the infraspinatus muscle, an upward pull by the supraspinatus itself and a downward pull by the weight of the humerus. This arrangement makes for stability of the head of the humerus, yet leads to wear and tear and tissue breakdown of one structure.

In cases of traumatic ossification a failure of calcium balance may occur in a more acute form, but enforced rest by immobilization defends the local recuperative

mechanism. In cases of toxic injury associated with the collagen diseases, the disorder is a chemical alteration in the ground substance.

Methods of reversing calcification have been sought. Responses to Suby's solutions for the dissolution of kidney stones and the chloroform and ether technics for gallstones are practically *in vitro* reactions, occurring as they do in accessible body cavities. The earliest stage of renal calcification occurs because of depolymerization of the mucopolysaccharides in the ground substance. Possibly the breakdown of polymers leaves molecular bonds open for the attachment of calcium ions. Knowledge of this process may lead to understanding of the "milk of calcium gallbladder." In the presence of this condition, lime salts are precipitated in the biliary tract, resulting in a permanent cholecystogram and also in persistent pain for the patient. Cholecystectomy and prolonged T-tube drainage do not bring relief. The calcification associated with chronic relapsing pancreatitis is also a pain problem, and the surgical operations described for this condition are not satisfactory. Again, knowledge of the metabolic alterations, especially in the interstitial tissue, may be clinically productive.

Immobilization of the elbow or thigh after injury and hematoma prevents myositis ossificans, since the production of phosphate-releasing enzyme is thereby diminished. Knowledge of pharmaceutical methods of controlling such a process also may help to prevent this crippling calcification. Volkman's contracture may follow destruction and resorption of ground substance. It is possible that an acute rise or fall in carbon dioxide tension may selectively damage fibroblasts and the surrounding ground substance. Hyaluronidase has been used for prevention of Volkman's contracture.

It is probable that the increased deposition of calcium that results in hypertrophic pulmonary osteoarthropathy may be caused by changes in oxygen and carbon dioxide tension as well as lowered temperature. In this condition a pulmonary lesion leads to clubbing of the fingers, owing to the increased size of the distal phalanges. Eradication of the pulmonary lesion leads to restoration of the normal size of the phalanges. One may speculate about these phenomena — the pulmonary lesion must cause a deficit in oxygen and carbon dioxide change. This change is not critical, but marginal; yet it alters the balance of calcium deposition and resorption in the extremity, where the temperature is probably lower than in the central area of the body.

The question of calcification in relation to roentgen irradiation is of interest. One may observe abnormal calcification in tissue after treatment for cancer; yet, with the use of irradiation for a painful shoulder with a calcified supraspinatus tendon, one often observes clearing of the calcium deposit after treatment. The painful disabling frozen shoulder, radiohumeral bursitis, stenosing paratendonitis and even chronic sprains and fibrositis may have a common denominator in ground substance. Progressive changes in the anterior carpal ligament of the wrist may lead to compression of the median nerve and disabling causalgia. Incision of the ligament and decompression are needed to produce relief. Incision also offers dramatic relief of radiohumeral bursitis, and surgical exploration of the shoulder in the presence of the supraspinatus syndrome may produce relief without altering the structure. One might speculate as to whether local metabolism, stimulated by the surgical maneuvers, leads to repair or better "adaptation." Relief from incision of the fascia in cases of radiohumeral bursitis is also dramatic, and is another example of relief of pain by mere incision of a fibrous struc-

ture. Incision relieves the pain of De Quervains disease by obvious decompression, but alteration of local metabolic biochemical factors may enter into the improved results.

Tissue alternatives available today are heparin, hyaluronidase and hydrocortone. Heparin, used for postoperative thromboembolic disease, leads to prompt disappearance of pain. Such relief may come from action on the connective tissue. Heparin is a mucopolysaccharide and competes with compounds occurring naturally in the ground substance. The polysaccharides of heparin are potent hyaluronidase inhibitors, and they may achieve their effect by inhibiting the breakdown of hyaluronic acid. An antiarthritic drug (butazolidin) has also proved beneficial in cases of superficial thrombophlebitis. The problems of blood coagulation and of arthritis may have a common biochemical background.

A knowledge of the physiologic nature of ground substance may lead to a better understanding of shock. It is known that shock may follow trauma, hemorrhage or infection and that blood transfusion usually prevents or cures it. It is also known that shock may become irreversible and that transfusion does not invariably cure it. Studies show that the interstitial fluid may vary widely in volume. Since ground substance is the hydrated gel in which the interstitial fluid is held, the chemical content of ground substance may hold the key to shock; the loss of vascular volume associated with shock may result from mass migration of fluid into the interstitial space, an effect mediated by the pituitary-adrenal axis. A regulatory mechanism of the body operates when circulating adrenocortical hormone inhibits the pituitary, preventing excessive production of (endogenous) ACTH. A regulating factor that controls the flow of fluid from circulation space to interstitial space must disappear to permit the development of shock.

When symptoms are relieved by therapy, the disease process itself or an untoward response of the organism to the disease may have been inhibited. The living organism requires "feedbacks," and the road by which chemical informants travel must be the interstitial area between the cell and the circulation. The harmful possible responses to stress and injury are demonstrable by the clinical application of Laborit's "cocktail." By blocking certain corticoid responses to injury, Laborit's mixture is said to protect the subject against shock. Blocking untoward responses to injury is important therapy. The same effect is obtained by the use of cold compresses for a sprained ankle.

Sprained ankle taxes one's clinical skill. It is often said that a sprained ankle is more uncomfortable than a broken one. With a fracture, immobilization in a plaster cast and non-weight bearing proceed without question, and comfortable healing follows. With the "roentgen-negative" sprain, tissue rest is often denied, and chronic discomfort and prolonged disability may result. Injection of procaine hydrochloride, a supportive dressing and a period of rest are assumed to avert the causalgic syndrome of chronic sprain. The severe pain of Sudeck's atrophy may be a neurotrophic phenomenon, yet is accompanied by decalcification and may be another type of mesenchymal disorder. Painful connective tissue conditions may involve the sympathetic nervous system, but changes in the ground substance may be the crux of the problem. In cases of acute sprain the addition of hyaluronidase to the procaine gives added relief.

Mild sprains may go untreated. When the duration of disability exceeds expectation, anxiety develops. It has become my practice in such cases to inject 1 per cent procaine hydrochloride, with hyaluronidase and hydrocortone added. After the

effect of the procaine wears off there may be increased local discomfort for twelve to eighteen hours, after which the improvement is dramatic. Pain goes, protective spasm disappears and function returns. This treatment is also used for radiohumeral bursitis and for shoulder conditions.

For chronic sprain in elderly persons the use of androgenestrogen hormone has been effective. It is known that ground substance is scant in the elderly. One may speculate as to whether these hormones help the fibroblast to secrete ground substance. Androgen-estrogen hormones have been used to aid union of bone fractures in elderly persons. Its effectiveness in the treatment of senility has been demonstrated. Perhaps solving the problems of ground substance may lead to solving the problems of aging and degeneration.

The treatment of metastatic cancer of the breast involves the use of hormones. In women over 60, estrogens are effective for mammary cancer in the soft tissues. For bone-eroding lesions, androgens are used with good effect. When bilateral adrenalectomy is used in cases of advanced mammary cancer there is often recalcification of bone-eroded areas, as well as palliation of the symptoms. Hypophysectomy accomplishes the same result. The relation of the pituitary adrenal axis to the mesenchymal connective tissue system is a fertile area for research directed toward understanding of tissue repair and of cancer and other diseases.

Recognition of the importance of ground substance helps to explain untoward results of surgical treatment in infants. It has been established that this gel occurs in larger amounts in the connective tissue of the young than in persons in middle life. It is also known that excessive edema at the operative site is more frequent in the young, and this is controlled by exquisitely careful handling of tissues and attention to electrolytes. Control should be aided by a knowledge of the behavior of ground substance.

Scar hypertrophy may resemble coral formation. The skeletons that pile up to make coral rock are like the fibroblasts that rush into the process of tissue repair. Control of the size of the "army of repair" is desirable. The growing capillary loop and the young fibroblast comprise the physiologic repair team. The zeal of the young must sometimes be curbed. I have used cortisone after electroconization of the uterine cervix to diminish the scarring, which could produce cervical dystocia in subsequent labor.

Decalcification of deposits in the subdeltoid area of the shoulder has been accomplished by daily use of diathermy as well as by roentgen therapy. But current knowledge of interstitial calcification is sketchy and contradictory. Baker observed that, with the use of toluidine blue, a previously noneffective dose of parahormone produced calcification in living mouse tissue. Yet Miller observed that toluidine blue retards calcification of rachitic rat cartilage *in vitro*. Toluidine blue has acted as an antidote to the action of heparin in certain problems of uterine bleeding, based on the assumption that the body may produce excess heparin. Connective tissue research, which may be fruitful in solving bleeding and coagulation, may perhaps yet reveal who is and who is not a person liable to embolic disease.

Consideration of the connective tissue as an active functional system deserves much scrutiny, but this idea was suggested over one hundred and fifty years ago by Bichat, whose career ended in 1802 at the untimely age of 31. The intravascular space has been accessible for ready sampling, and with the flame photometer its contents are revealed. Some of the disturbances within the cell are revealed through morphologic changes, postmortem

and perhaps *in vivo*. The interstitial area remains to be explored, and that is the challenge to modern research. The difficulty of assaying physiologic changes in an amorphous material like ground substance will require masterful studies, as modern as jet propulsion and atomic engines. Perhaps, of the pathologic tumors, the myxoma represents the most prodigious amount of ground substance. When one describes gel-like masses in tissue as resulting from "mucoid" degeneration, it may be an example of loose thinking and looseness in terminology, which allows one to confuse entoderm with mesoderm. When the pathologist's slide has shown that "fibrinoid degeneration" has developed in the presence of collagen diseases, one must search for the altered processes in living tissue that led to this altered structure.

The fibroblastic cell has been taken for granted. There are many chronic disorders of the musculoskeletal system that have been poorly understood. The treatment of physiotherapy for these conditions has now reached ultrasonics. Treatment by spine manipulation cultists has been rampant. Hypertrophic arthritis, fibrositis and rheumatism are still mysteries. Fruitful knowledge may come when modern tissue culture technics such as are used in cancer research are used to grow fibroblasts taken from embryonic mesenchyme.

SUMMARY

The author suggests that the ground substance of connective tissue may have an important function, possibly as the connector between the circulation and the cells.

In youth you easily fall in love with words, written and spoken. You come, like other lovers, to feel an unreasoned sensuous thrill of joy at a word because it is just what it is—the sound of it and the look of it on a page—as a child's mind thrills at the touch of fur because it is sleek and at that of a file because it is not. Apart from the interest of their use in any particular place, such words as "burnish," "crozier," "luster," "beatitude," "dawn" becoming enamoring objects, with glowing hearts of their own, like red wine or rubies.

A sculptor alone in his studio will fondly stroke a lump of unworked marble or bronze; he can dote on its qualities. A writer or a good reader will do much the same: his mind will finger single words and caress them, adoring the mellow fullness or granular hardness of their several sounds, the balance, undulation or trailing fall of their syllables, or the core of sunlike splendor in the broad, warm, central vowel of such a word as "auroral." Each word's evocative value or virtue, its individual power of touching springs in the mind and of initiating visions, becomes a treasure to revel in.

—*Montague*

Primary Cholesteatoma of the Ear

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THERE is probably no other pathologic surgical entity that has raised so many diversified opinions as to its nature, pathogenesis, classification and treatment as has aural cholesteatoma. Indeed, a real state of chaos and confusion still exists in this field. Even the term "cholesteatoma" itself has been challenged lately by such men as Young,[1] Tumarkin,[2] Meltzer[3] and others,[4] who have proposed to name it cholesteatosis. Some still believe that aural cholesteatoma is not a tumor but only a product of infection,[5] existing or preexisting chronic otitis media; they even go so far as to claim that if there is no evidence in the patient's history, or if no signs of apparent or residual infection are observed at operation, the patient had otitis neonatorum at the dawn of his life, perhaps thirty or forty years before, and that a sclerotic mastoid had developed as a result. These otologists are blind and deaf to the fact that there are many cholesteatomas, without any present or past infection, in aged persons with wholly pneumatized mastoids. Many generally accepted textbooks still classify the entity on the basis of this false assumption and use for aural cholesteatoma the unfortunate term "pseudocholesteatoma," introduced by Körner[6] in 1899. The prefix "pseudo" means falsely resembling; it certainly is not synonymous with "secondary." It is a well-established fact that no pathologist can differentiate histologically primary cholesteatoma from a secondary one.[7] Therefore, in my classification I propose to abandon altogether the terms "pseudocholesteatoma" and "cholesteatoma verum," which only add to the confusion, and to content myself with the terms "primary" and "secondary." True, some otologists, e. g. McKenzie,[8] maintain that all aural cholesteatomas are primary; others, like Biber,[10] declare that all are secondary. It is easier to assume that cholesteatoma is primary when it is not accompanied by infection; there is no mention of it in the history and there is no evidence of it at operation or in postoperative laboratory studies. It is often much more difficult, in the presence of both phenomena, to establish which of them started first.[9]

Aural cholesteatoma, like cholesteatoma of the brain, meninges, mandible, breast, or any other part of the body is an ectodermal tumor of the cystic type, an inclusion cyst as Fowler Sr.[10] maintains, or an epidermoid cyst, according to Eggston and Wolff.[11] It takes its origin either from ectodermal embryonic rests (anlage),[12] from aberrant islands of more highly developed flat stratified epithelium,[13] or from a fully developed squamous epithelium of the tympanic membrane by cupping of the part of the flaccid membrane,[14] by invasion through a perforation in it.[15] Cholesteatoma may also develop from the external canal by invasion of epithelium into a preformed cavity due to circumscribed osteitis followed by sequestration[16] or by displacement of epithelium as a result of trauma.[17] It may take its start in keratosis obturans,[18] or finally from desquamating metaplastic flat epithelium developed in course of chronic otitis media with perforation.[19] Aural cholesteatoma displays, independ-

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ently of where it occurs, all Ziegler's attributes of a tumor: It is a newly formed tissue of atypical structure; it serves no useful purpose in the economy of the body; its growth has no typical termination, and it is destructive to the surrounding healthy tissues; its matrix possesses osteoclastic ability, as was so ably demonstrated by Walsh[20] in his cases of marsupialized cholesteatoma. Enough evidence has accumulated to prove that primary aural cholesteatoma without present and past inflammation of the middle ear, even as otitis infantum, does occur. I shall not try to enumerate all the authors who have presented convincing cases to prove this point —there are a legion of them. I should like only to present one more striking example of primary cholesteatoma, which I have recently observed and treated.

REPORT OF CASE

B. S., a 60-year-old white man was first examined by me on Oct. 6, 1954. On the previous day he had suddenly become dizzy; he was nauseated and vomited profusely several times. The patient, his older sister and his wife denied the occurrence of any ear ailment in the past; there was some impairment in hearing, which they attributed to his age. Both ear canals were impacted with dark, hard cerumen. It was removed with difficulty from the right meatus by irrigation; the tip of the plug and its surface were covered with scales of keratinized epithelium. The lumen of the canal was much wider than the opening into it. The eardrum was slightly dim but otherwise normal. Because of still persisting dizziness and spontaneous nystogmus, mostly to the left, I abstained from irrigating the left canal and tried to remove the wax with a spatula. After the canal had been cleaned to about the juncture of its cartilaginous and osseous parts, the appearance of the cerumen

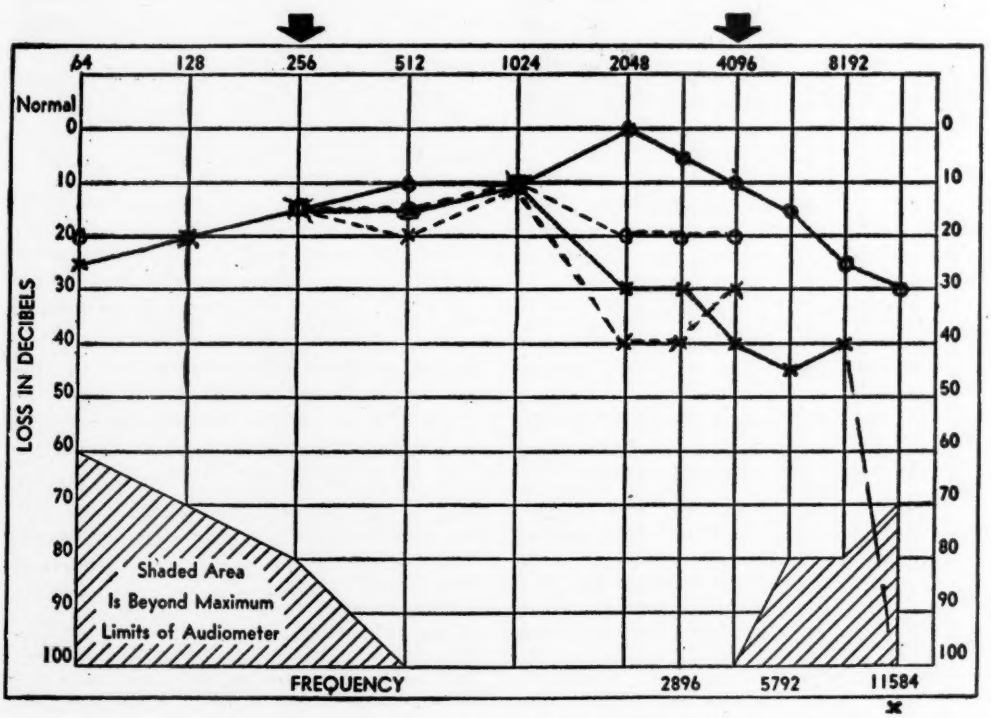

Fig. 1.—Charted hearing loss (in decibels) of patient B. S., a man aged 60, in whose case a primary cholesteatoma of the ear was verified.

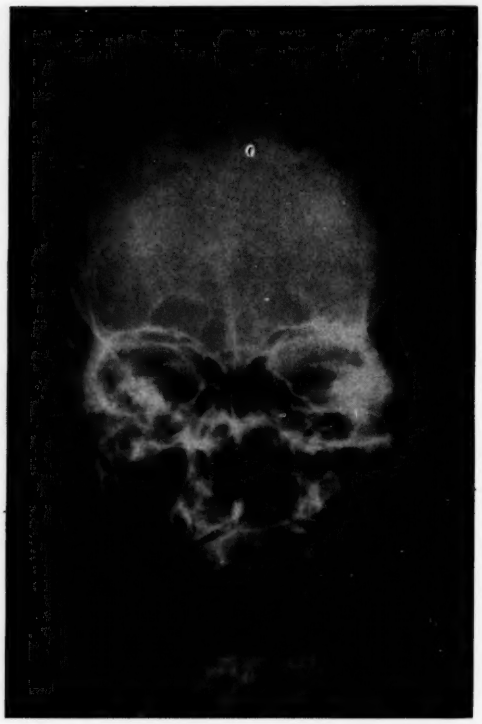

Fig. 2. — Roentgenogram taken in the case of patient B. S.

changed; it was mixed with pearly flakes typical of cholesteatoma. On digging deeper I noted that the cerumen had gradually disappeared, and I became aware, because of the absence of most of the posterior bony wall of the canal, that I was removing cholesteatomatous masses from the mastoid cavity. When I attempted to penetrate farther, the patient became dizzy. After cleansing the canal I noticed that a small part of the posterior wall at the tympanic membrane was intact and that the membrane itself, although lustreless, showed only a minute, slitlike dry perforation in the posterior part of Shrapnell's membrane, just above the middle third of the posterior fold and parallel to it. The margins of the perforation were thin and smooth. The cholesteatomatous masses were completely odorless, and there was no pus or other discharge. The opening to the meatus was quite narrow. Audiometric tests revealed slight presbycsis on the right side, the hearing for low tones on the left side was almost the same but for high tones from 2,048 decibel vibrations up was worse than on the right side, and 45 decibels was the greatest loss for 5,792 decibel vibrations.

Bilateral spontaneous horizontal nystagmus of the first degree was stronger to the left. Response to minimal caloric stimulation on the right side was normal; on the left (ice cold ethyl alcohol was used) it was much stronger, but the fistula test gave negative results. I presume that the matrix of the cholesteatoma sealed the small fistula thoroughly. The mucous membrane of the nose was pale and slightly atrophic. Transillumination of the nasal sinuses revealed no abnormality. The diagnosis was bilateral keratosis obturans; cholesteatoma of the left external canal and temporal bone, and labyrinthine fistula.

The consulting dermatologist, Dr. J. J. Corcoran, observed severe seborrheic desquamative dermatitis of the scalp and ears (pityriasis sicca type), without obvious inflammatory changes, and mild senile asteatosis of the skin of the trunk and extremities.

The pathologic and chemical diagnosis of the masses removed from the left external meatus was cholesteatoma mixed with cerumen.

Roentgen examination of the left mastoid revealed that the mastoid had originally been pneumatic in type, and a few small air cells with well-defined walls were still seen in the superoposterior portion of the petrous area. In the entire mastoid, however, there was complete absence of cells, and the large defect, smooth and well rounded, was present in this area. This destruction is typical of cholesteatoma and not due to any surgical exenteration. There was no evidence of an infection involving the left mastoid. A thin wall was observed posteriorly and inferiorly surrounding the large defect. Anteriorly the destructive process encroached on and actually involved the posterior wall of the auditory canal. The knee of the sinus was well demarcated and intact.

The impression was that of cholesteatoma of the left mastoid process.

The right mastoid was pneumatic, with well-developed medium and small cells and well-defined cell walls. The dural plate and the knee of the sinus were fairly prominent. The impression was that of a normal, fully pneumatized right mastoid.

Examination of the chest showed blunting of the left costophrenic angle, indicating some residuals of old pleuritis. No active parenchymal lesion was observed in either lung field. There were some bilateral emphysematous changes. There was no evidence of bronchiectasis. Examination of paranasal sinuses

showed no evidence of intrinsic pathologic change (*H. L. Riner, M.D., radiologist*).

On October 11, postauricular radical mastoidectomy was performed. Just below the suprameatal spine a narrow part of the mastoid, together with a major part of the posterior bony wall of the external canal, was missing. The rest of the corticalis was thinned but not perforated. After removal of the whole outer wall of the mastoid to its tip, including that of the antrum, a huge cholesteatoma occupying the whole area was exposed. When it was cautiously removed, almost *in toto*, a large cavity with smooth walls presented itself. A very few small pneumatic cells in the petrosotemporal angle and behind the lower part of the bony plate of the sigmoid sinus appeared normal; some of them contained cholesteatomatous lamellae or matrix. All were curetted. No perforation was observed either in the tegmen or in the plate of the sinus. I intended to preserve the ossicular chain, but after removal of the outer wall of the aditus to the antrum the cholesteatoma was observed not only in the aditus but in the epitympanum, enveloping the body of the incus with its short process and the head of the malleus; they were removed. The malleus seemed

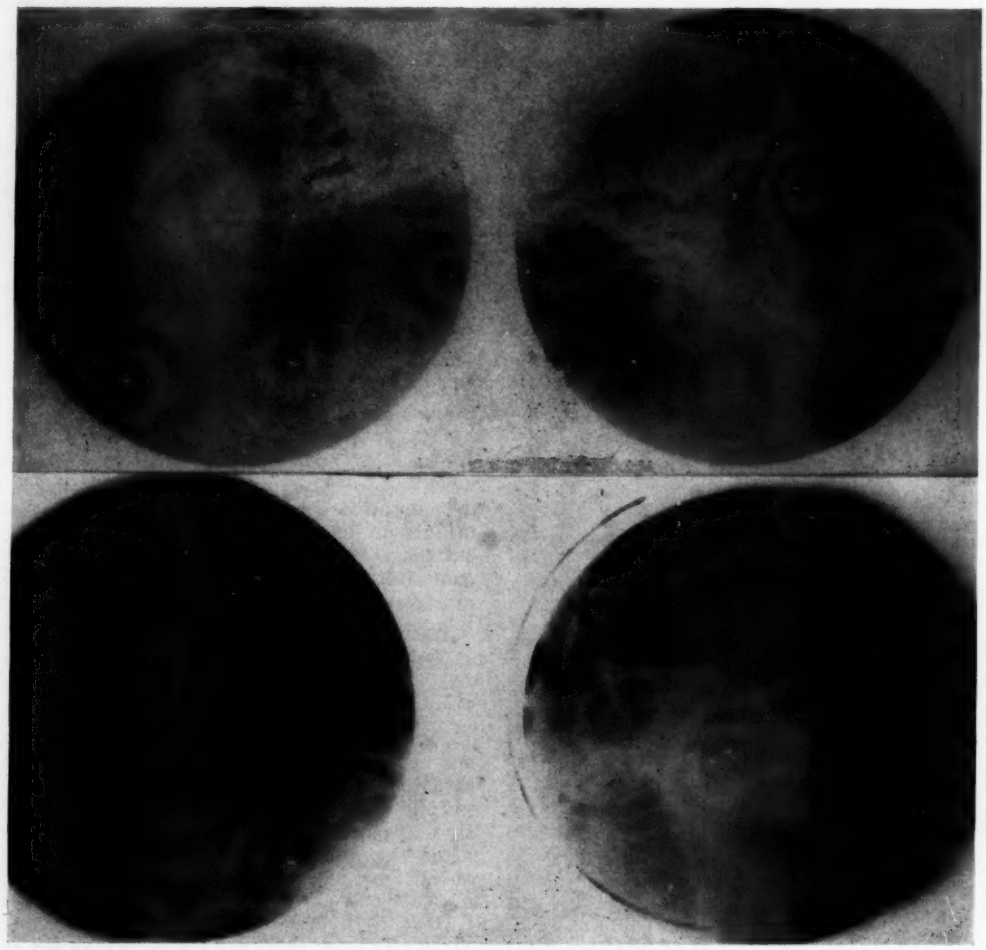

Fig. 3.—Facsimile of original roentgenograms taken by the VA Recorder Service Center, Columbus, Ohio. (*Reproduced by permission.*)

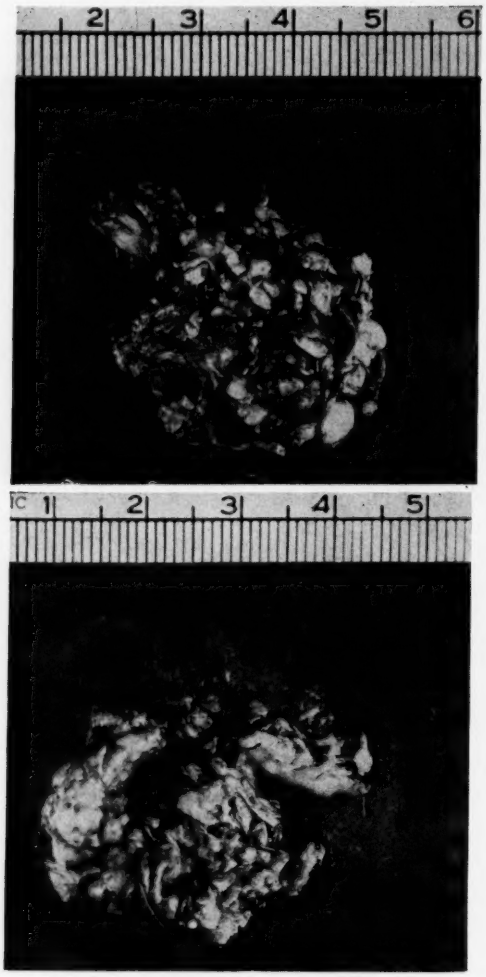

Fig. 4.—Two views of gross specimen excised from mastoid and middle ear. Tissue is compatible with diagnosis of cholesteatoma.

grossly normal; the body of the incus had a rough surface. Inspection of the area after it had been cleaned from the rests of cholesteatoma revealed flattening of the prominence of the horizontal canal and, approximately in its middle, a very tiny fistula; the tegmen tympani was not perforated, and the tympanic cavity below appeared normal. During the whole operation no inflammatory changes, such as granulations, pus or other exudate, or even hyperemia, were noticed, and the cholesteatoma was odorless. After completion of the operation the tissues removed from different places were sent in separate jars for examination.

Pathologic Report, First Specimen.—Gross: The specimen consisted of rather firm, irregular tissue and measured 2.5 by 2.5 by 1.5 cm., submitted as cholesteatoma. The external surface was rough; some areas were pale pink, others greyish with a pearly lustre. *Microscopic:* Microsections revealed isolated aggregates of squamous epithelial cells, bordered on the surface of the flat cells by homogeneous collagenoid material within which darker-staining concentric lamellae were thickly enmeshed. *Diagnosis:* Tissue from middle ear and mastoid compatible with cholesteatoma.

Pathologic Report, Second Specimen.—Gross: The specimen consisted of two small bones submitted as the incus, measuring 1 by 0.3 by 0.2 cm., and the malleus, measuring 1 by 0.2 by 0.15 cm. The external surface of the body of the incus appeared to be eroded; that of the malleus was not remarkable. *Microscopic:* The microsections consisted chiefly of decalcified osteoid material enmeshing poorly defined bony trabeculae; the external surface of the body of the incus was rugged, probably as a result of erosion. *Diagnosis:* Malleus showing no significant changes; incus with superficial erosion.

Pathologic Report, Third Specimen.—Gross: The specimen consisted of numerous hard, tannish portions of bone measuring up to 0.5 by 0.3 by 0.2 cm., submitted as taken from the mastoid process, with request for decalcification. *Microscopic:* The microsections demonstrated decalcified bony fragments enmeshed in pink-staining lamellated material. Within the lamellated material were numerous cleftlike spaces, apparently cholesterol crystals. *Diagnosis:* Mastoid tissue compatible with cholesteatomatous infiltration.

Comment of Pathologist (Dr. William Hentel).—There was no evidence of inflammatory reaction in any of the specimens.

Postoperative Course.—The patient's course was entirely satisfactory. His labyrinthine symptoms subsided, his general condition was greatly improved, and he gained weight steadily—20 pounds (9.1 Kg.) within two months after the operation. The anemia also subsided; from a preoperative red blood cell count of 3,400,000 per cubic millimeter, with 10.8 Gm. of hemoglobin, and a hematocrit reading of 36 per cent, these values were elevated to corresponding levels of 4,810,000, 15.8 Gm. and 46 per cent respectively (December 15).

Epidermatization of the operative cavity was complete at the end of the second postoperative month.

COMMENT

In view of the patient's age and a fully pneumatized right mastoid, otitis media neonatorum or infantum as a causative factor is out of question. A very little, insignificant change in the left tympanic membrane, caused by contrapressure from both sides by the tumor, and macroscopically and microscopically established absence of an inflammatory process or its residuals anywhere in the ear or the temporal bone, exclude inflammation as a primary or secondary causative factor.

Undoubtedly this was a case of primary cholesteatoma, apparently without secondary infection, that started as keratosis obturans. After destroying the posterior wall of the external canal it expanded into the temporal bone, gradually replaced almost wholly its pneumatic cellular structure, and reaching the epitympanum perforated the flaccid membrane squeezed between two parts of the tumor and, finally, the bony horizontal canal. This lengthy process, lasting probably several years, apparently passed unnoticed until a sudden labyrinthine attack took place.

In the formation of keratosis in this case, two factors played an important role: one was severe chronic seborrheic desquamative dermatitis without inflammatory changes; the other, a developmental anatomic condition of the external meatus, namely, a wide lumen and a narrow outer opening, favoring retention of cerumen and desquamated epithelium; pneumatic cells developed in the wall, and their thin septums facilitated expansion of the tumor.

My case differs in some respects from other cases of keratosis obturans hitherto reported. In some of those cases the cholesteatoma was smaller, did not penetrate into the mastoid, caused perforation in the eardrum, and necrosis with sequestration of the external canal followed after healing because of its narrowing or stricture. In other reports, when the cholesteatoma did invade the temporal bone, infection of the latter was always present. In Harpman's case this kind of cholesteatoma developed insidiously in an 11-year-old boy, who was first brought to him with signs

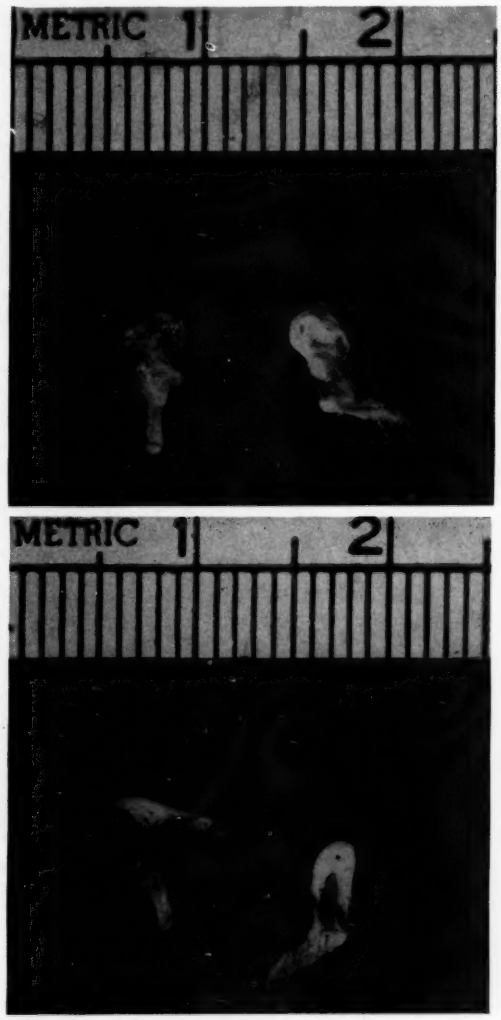

Fig. 5.—Photographs of malleus and incus. The former seemed grossly normal; the surface of the latter was roughened.

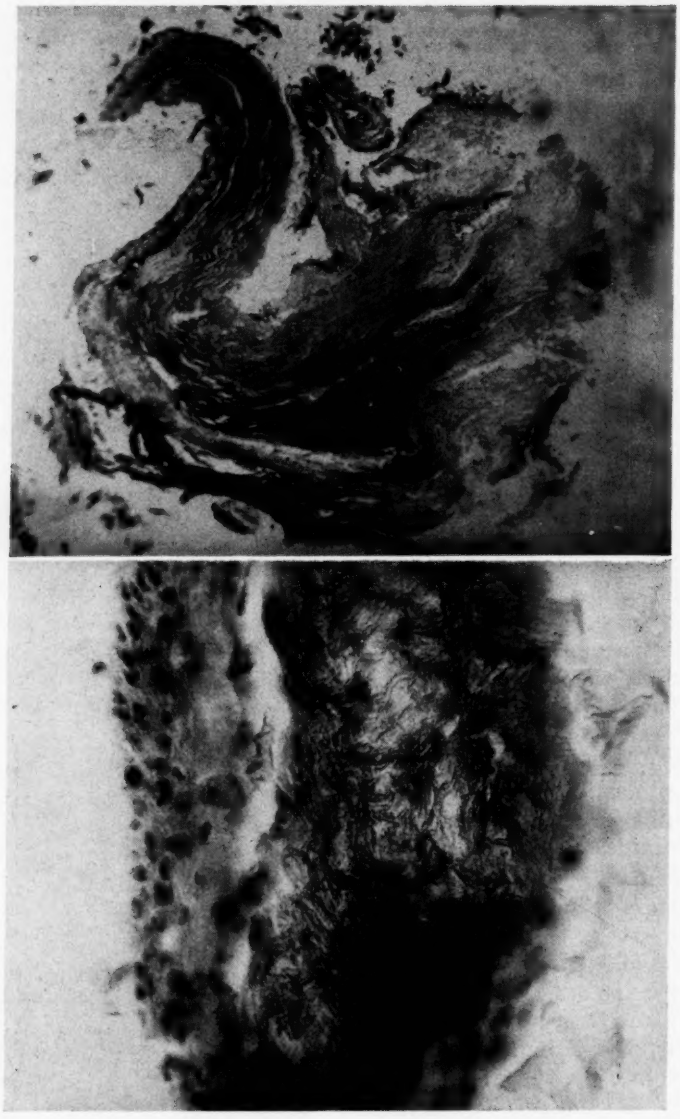

Fig. 6.—Photomicrographs of cholesteatomatous tissue from middle ear and mastoid.

of cerebellar abscess. This was evacuated at operation, together with much pus from all cells of the well-pneumatized mastoid process. In addition, the boy had chronic nasal sinusitis and bronchiectasis, which, in the opinion of Harpman[15a] and others,[21] occur with unusual frequency in patients with aural keratosis. No such changes were present in my patient. This fact probably prevented infection.

SUMMARY

Problems concerning the pathogenesis, nature, terminology and classification of aural cholesteatoma are discussed. It is suggested that the terms "pseudocholesteatoma" and "cholesteatoma verum" be dropped.

A case of primary cholesteatoma, derived from keratosis obturans and different in some respects from the cases of aural keratosis heretofore reported, is reported and discussed.

RIASSUNTO

Vengono trattati i problemi relativi alla patogenesi, alla natura, alla nomenclatura e alla classificazione del colesteatoma dell'orecchio. I due termini di pseudocolesteatoma e di colesteatoma vero devono essere abbandonati.

Viene riferito e discusso un caso di colesteatoma primitivo dell'orecchio, derivante da una cheratosi otturante e diverso, per certi aspetti, dai casi descritti fino ad ora.

RÉSUMÉ

Les problèmes concernant la pathogénèse, nature, terminologie et classification, du cholestéatome auralsont discutées. On recommande d'eliminer les noms "Pseudocholestéatome" et "cholestéatoma verum."

On reporte et discute un cas de cholestéatome primaire, originé de keratosis obturans et différent des cas de keratose aurale reportés jusqu'a présent.

RESUMEN

Se comentan los problemas que se presentan en relación con la etiopatogénesis, naturaleza, terminología y clasificación del colesteatoma de la oreja. Se sugiere que se abandone el término "pseudocolesteatoma" y "colesteatoma verum."

Se comunica y comenta un caso de colesteatoma primario derivado de una queratosis obturans, que difiere en algunos aspectos de los casos de queratosis aural que se han comunicado en otros sitios.

ZUSAMMENFASSUNG

Es werden Probleme der Pathogenese, der Wesensart, der Terminologie und der Klassifizierung des Cholesteatoms des Ohrs erörtert. Es wird vorgeschlagen die Ausdrücke "Pseudo-Cholesteatom" und "Cholesteatoma verum" fallen zu lassen.

Es wird der Fall eines primären Cholesteatoms, das von einer Keratosis obturans abstammte und in mancher Hinsicht sich von den bisher publizierten Fällen von Keratose des Ohres unterscheidet, berichtet und erörtert.

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He who purposely cheats his friend, would cheat his God.

—*Lavater*

He who allows himself to be insulted deserves to be.

—*Corneille*

Surgical Treatment of Mitral Stenosis

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FURTHER discussion of this subject may appear unnecessarily repetitious. Such an attitude, however, implying a fixed opinion, seems unwise in view of the wide disagreement revealed by a forthright appraisal of the situation. Many years of meticulous investigation produced a mass of information in which relatively few were well versed until quite recently. The classic clinical picture of mitral stenosis, with its many complexities and unanswered questions, attracted many to cardiology. Among surgeons, however, this subject aroused little more than sporadic interest until Bailey[1] and Harken almost simultaneously completed successful valvulotomy.[2] Surgeons desiring to operate often encountered hesitancy in their medical colleagues, who, contending that victims of mitral disease did quite well, postponed operation until its efficacy had been proved. Soon the roads to two of our cities were clogged with patients, while a few, probably lost, filtered into other hands. The evidence began to mount. This invasion of cardiology by a group of neophytes, the surgeons, sparked a renewed interest. With refined methods the investigation of new and old concepts has produced an array of new ideas, terms, technics, syndromes, classifications and the like, which grows daily more impressive. This renewed activity, born of the surgical approach, appears to offer much hope for the ultimate answers to many problems. Wide disagreements persist, however, and are often particularly concerned with the selection of patients for surgical treatment and with the results thereof. In this report of our first 100 cases, small indeed compared to other series, emphasis is placed on these two aspects in the hope that it may contribute to the resolution of some disagreements.

Although this paper is not concerned primarily with surgical and other technical details, at least a cursory review of procedure and observations forms a suitable background for it.

All patients were studied first by the cardiologists. Many lacked a history of rheumatic fever, but most had been aware of a murmur since early childhood and had had early symptoms of undue fatigue. Progressive orthopnea and dyspnea frequently had first prompted inquiry about surgical treatment. Some patients, often on a physician's advice, had delayed such action until hemoptysis, pulmonary edema, cardiac arrhythmia or failure of medical therapy had occurred.

Complete physical examination was supplemented by detailed laboratory studies, including roentgenographic and electrocardiographic investigations, with particular attention to cardiac contour, mitral calcification, pulmonary congestion, esophageal compression, the pattern of enlargement of the chamber, axis deviation, rhythm, timing of murmurs and many other pertinent details.

In some cases, because of academic in-

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terest or observations that clouded a decision, further studies have been completed. With the angiocardiographic technic[3] it soon became evident that the size of the pulmonary artery was not correlated directly with the degree of pulmonary hypertension. The accuracy of visualization of the left atrium has not been paralleled by the examiner's ability to make a reliable pronouncement as to the status of clot formation. The ability to outline the enlargement of other chambers, particularly a large left ventricle, often has been useful but not constant. The delay in the lesser circuit has been graphically portrayed. The further use of the angiocardiographic method, particularly in the study of postoperative changes, seems indicated by this experience.

Routine cardiac catheterization[4] was completed in 50 of these cases to clarify specific problems, and the results are presented later in the paper. In some of these, similar postoperative studies have been done. Operation on the other 50 patients was based on clinical evaluation only.

Long periods of preparation before both operation and cardiac catheterization were common. Previous digitalization proved generally inadequate. Further attention to diet, electrolyte and fluid balance, activity, anemia, diuresis, etc., was generally needed to bring the patient to a stable and acceptable condition. The attempt to convert the fibrillator routinely seemed less important than adequate control of the ventricular rate.

The success of operation is closely linked to anesthetic practice. Preoperative visits allayed fear. For a restful night and relaxed arrival for operation without depressed circulation or respiration, the administration of pentobarbital (100 mg.) at bedtime and scopolamine (0.3 mg.) one hour prior to the operation was effective. Anesthetic trial runs were not uncommon. Anesthesia in a majority of cases, either in the patient's room or in the operating room, has been induced either with intravenous administration of 2.5 per cent pentothal (100 mg.) or inhalation of anesthetic mixtures, mainly cyclopropane. The agents proved less important than the ability to manage them and obtain a smooth induction and adequate oxygenation. A large endotracheal tube lubricated with anesthetic jelly was then inserted under direct vision after administration of a relaxant (succinylcholine, 10 to 20 mg.) and topical anesthesia with 5 per cent cyclaine. A light plane feasible for operation was maintained with ether. In some instances the patient was conscious but without pain or memory. No attempt was made to control the arrhythmias associated with surgical manipulation unless they interfered with circulation. The use of local or anesthetic drugs by infusion, intrapericardial injection or topical application was abandoned, not only because of frequent myocardial depression but because the heart usually stabilized and tolerated manipulation quite well. Bradycardia was treated with atropine (0.1 mg.) repeated as necessary. Digitalis, quinidine and similar drugs were handled in cooperation with the cardiologist to meet situations as they arose and not as routine preventive agents. A well managed anesthetic technic, with proper attention to a clear airway, adequate oxygenation and assisted ventilation, was most consistent with success and best tolerated by the "poor risk" patient.[5]

An anterolateral approach through the third or fourth interspace or rib has proved simplest and entirely satisfactory. There is no objection, however, to other incisions. The left appendage approach was used almost exclusively, but early excision of this to permit extrusion of clots did not assure freedom from embolism. Suture closure in addition to purse strings insured control of postoperative hemor-

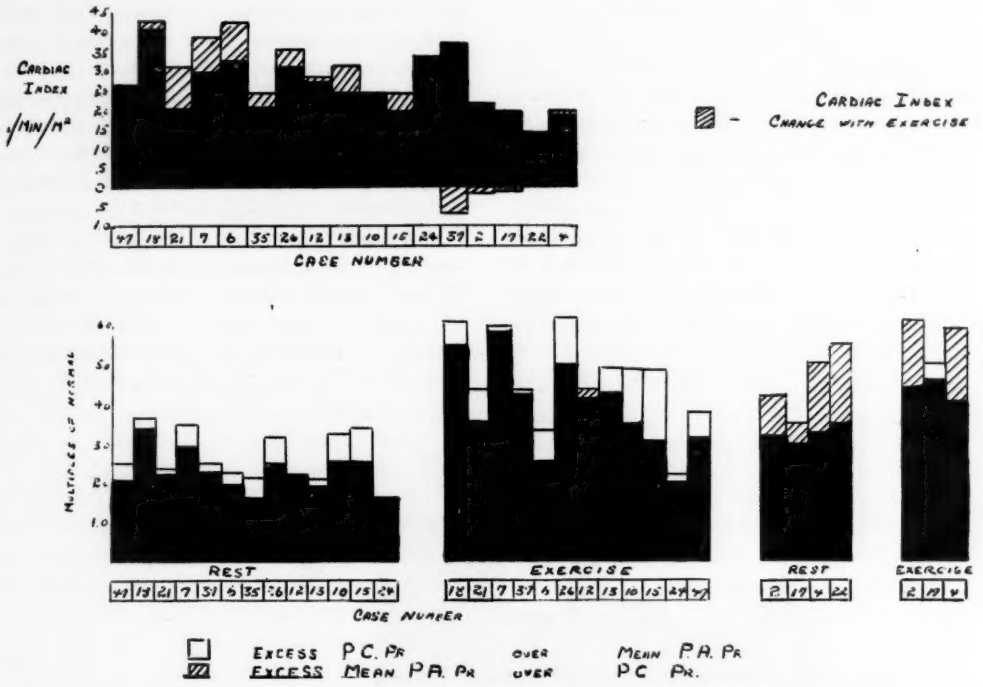

Fig. 1.—Cardiac catheterization data on 17 patients with excellent results after commissurotomy. Note the increase in cardiac index on exercise in 10 of 17 cases. (In the lower portion of this chart the observed pulmonary capillary pressure and the mean pulmonary artery pressure are expressed as multiples of their normal values: P. C., 9 mm. Hg.; P. A. (mean), 15 mm. Hg. Note excess elevation of P. C. over the mean P. A. pressure in 11 of 13 cases.)

rhage. The stenotic valve was usually opened by the finger-fracture technic extended well into the ventricle. In a significant number of cases in which there was little or no posteromedial commissure, adequate opening was obtained by restricting the split to the anterolateral commissure. Some sclerosed or calcific valves required knife or guillotine. In the presence of any form of cardiac arrest, valvulotomy was completed both before and after cardiac resuscitation, as the situation warranted. Perseverance is essential to obtaining adequate opening of the stenotic valve. In no case in this series did it produce insufficiency. The pericardium was incompletely closed to the left pleural space, which was drained routinely for a few days. Postoperative treatment with antibiotics and other agents followed well accepted plans.

Some of the data obtained by cardiac catheterization in the cases of 50 patients are contained in Table 1. A few studies are incomplete, owing to premature termination of the procedure for a variety of reasons. They may be summarized briefly in this manner:

The pulmonary capillary and arterial pressures were uniformly elevated, increased with exercise and slowly returned to the resting level. An increase in pulmonary arteriolar resistance was regularly observed and often was proportionately greater than that in the pulmonary capillary area. The cardiac index, almost al-

ways significantly below normal, rarely showed the normally expected increase with exercise. In many instances it remained static or showed an appreciable fall. The contour of tracings often gave valuable aid in estimating the degree of mitral and tricuspid insufficiency. The calculated mitral area seemed to conform to the surgical estimate. It is evident that, although these figures closely conform to the basic pattern, there is still wide variation in the departure from normal. After a sufficient postoperative follow-up, all results have been classified as excellent, good, poor and fatal. Corresponding cardiac catheterization data on some of the group classified as excellent may be compared to some of those in the group classed as poor, by reference to Figures 1, 2 and 3.

In 13 cases in which results were excellent (Fig. 1) the proportionate pressure significantly exceeded the similar proportionate increase of the pulmonary arterial mean pressure except in 2 patients (Nos. 12 and 24) in whom no difference existed. In response to exercise both pressures regularly increased, but the proportionate rise in pulmonary capillary pressure still

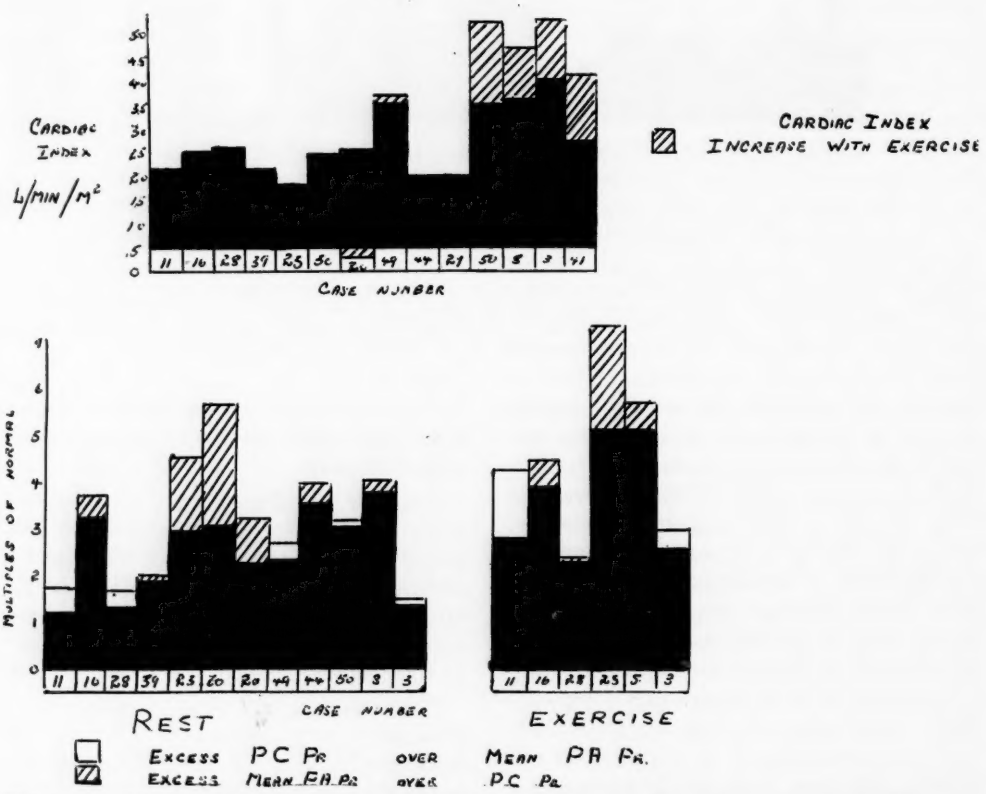

Fig. 2.—Cardiac catheterization data on 14 patients with poor results after commissurotomy. Note failure to increase cardiac index in 9 of 14 cases (Nos. 3, 8, 41 and 50). The patients in these cases, although hemodynamically the results were good, did not undergo valvulotomy because of extensive atrial clotting. (In the lower portion of the chart, the observed pulmonary capillary pressure and the mean pulmonary artery pressure are expressed as multiples of their normal values: P. C., 9 mm. Hg.; P. A., 15 mm. Hg. Note excess elevation of P. A. over P. C. pressure in 7 of 12 cases.)

exceeded that of the proportionate rise in mean pulmonary arterial pressure, except in 1 patient (No. 12). In referring to the lower parts of Figures 1 and 2, attention is directed to the fact that multiples of normal resting pulmonary capillary pressure (9 mm. of mercury) and of normal resting mean pulmonary arterial pressure (15 mm. of mercury) were plotted. The pulmonary arteriolar resistance, although definitely elevated, still did not reach during either rest or exercise the extremely high level noted in other groups (Fig. 3). The cardiac index generally was moderately reduced but increased with exercise except in 3 patients (Nos. 7, 10 and 24), with no change, and in 1 patient (No. 37) with a minor fall. These patients, who averaged 37 years in age, ranging from 21 to 50, had had disease for an average of twenty-one years and had been treated for cardiac disability for 3 and one-tenth years between the extremes of one and eight years. Seven had normal sinus rhythm, and 6 had auricular fibrillation.

Four other patients (Nos. 2, 4, 17 and 22), with whom excellent results were obtained, did not follow this pattern. Not only did their observed pressure readings grossly exceed those of the previous group, but the proportionate rise in mean pulmonary arterial pressure exceeded that of the pulmonary capillary pressure during both rest and exercise. The cardiac index was generally at a lower level and did not significantly change with exercise (Fig. 1). A tremendous increase in resting pulmonary arteriolar resistance and an inordinate increase with exercise also were observed (Fig. 3). The average age was 32 years. The onset of disease dated back fifteen years, and treatment for cardiac disability had covered five years.

The data on the groups classified as having poor or fatal results are detailed in Figures 2 and 3. If one uses the same method of plotting multiples of normal as was used in the lower part of Figure 1, it can be seen that, at rest, the proportionate rise of the mean pulmonary arterial pressure exceeded that in the pulmonary capillary area and was exaggerated on exercise. The cardiac index, uniformly at a very low resting level, did not increase with exercise. Attention is called to patients 3, 8, 41 and 50 (Fig. 2), who, although they appeared to be sound hemodynamic risks, particularly on the basis of the cardiac index, had poor results because extensive atrial clotting prevented adequate valvulotomy. A marked elevation of pulmonary arteriolar resistance generally increased with exercise, indicating progressive and significant vascular change (Fig. 3). The average age of the patients in this group was 43; the age range, between 33 and 54. The onset of disease dated back twenty-five years, and the patients had been treated for cardiac disability for fourteen years. All except 1 had had protracted auricular fibrillation.

Results. — The cardiologists associated with the project classified the results in these 100 cases as excellent, good, poor and fatal. Patients grouped under "excellent" showed marked clinical improvement, consistent with normal habits of living and work, without symptoms or signs of cardiac disability. Dietary restriction and diuretics became unnecessary, and digitalis often was discontinued. Objective evidence of such recovery is illustrated by the preoperative and postoperative cardiac catheterization studies of 2 patients in Table 2 and the heart plates in Table 1. The patients with "good" results expressed satisfaction with their progress, although they still had to remain under fairly constant supervision. Those with "poor" results required the same or even more energetic therapy and either had shown no improvement or had lost ground since the operation.

TABLE 1.—*Cardiac Catheterization Studies of 48 Patients Subjected to Mitral Commissurotomy**

Patient	*Age*	*Sex*	*P.C.*		*P.A.*		*P.A.M.*		*PAR (dynes-sec-cm.$^{-5}$)*		*C.I. L/Min/M^2*		*Result*
			R.	*Ex.*	*R.*	*Ex.*	*R.*	*Ex.*	*R.*	*Ex.*	*R.*	*Ex.*	
A.D.	47	M			69/30	105/43	48	71			3.10	4.03	E
G.W.	31	F	29	40	99/41	157/51	63	92	772	1237	2.25	2.15	E
D.C.	32	M	13	26	30/12	50/28	20	38	91	112	3.53	4.84	P
E.J.	28	F	29	37	107/56	110/64	75	84	1201	1200	1.91	1.96	E
E.P.	27	F	21	35	38/20	60/31	28	40	110	62	3.31	4.21	E
J.H.	33	M	32	54	58/29	119/59	43	87	194	434	2.83	3.79	E
G.D.	39	F	34		81/41	128/80	60	98	958		1.49	1.36	P
E.G.	21	F	17		51/21	95/39	33	58	463		2.01		G
M.C.	39	F	30	40	56/28	67/38	40	53		281	2.43		E
C.R.	43	F	15	38	25/14	54/27	19	41	114	55	1.76	2.73	P
A.L.	28	F	22	38	52/28	113/55	35	66	231	470	2.62	2.77	E
E.V.	31	F	20	44	41/24	68/36	29	48	195	70	2.44	3.01	E
I.P.	24	M	19	32	39/22	63/27	27	40	204	117	1.72	2.98	G
A.S.	47	F	31	40	50/25	69/35	41	47	259	142	1.96	2.49	E
A.B.	44	F	29	35	74/40	85/48	54	66	602		2.02		P
L.T.	39	F	27	45	84/38	112/50	53	70	1466	2475	1.93	1.81	E
S.P.	34	F	33	55	74/36	115/58	51	83	257	379	4.15	4.37	E
H.C.	40	F	24	38	104/40	129/56	64	86					G
B.C.	47	M	25	30	70/42	103/53	49	68	659	1077	2.02	1.96	D
A.B.	36	M	21	40	46/25	76/43	34	55	252	204	2.01	3.10	E
V.L.	31	F	32		112/58		82		1940		1.40		E
F.R.	51	F	27	46	115/47	183/83	68	113	1517		1.36		P-D
R.D.	50	F	15	20	36/18	44/24	24	30	137		3.30		E
S.		F	27	38	42/26	54/31	32	43	153		1.57		G
G.B.	29	M	29	56	54/28	115/55	38	75	119	231	3.19	3.46	E
E.Z.	47	F									1.50		P
M.K.	37	F	15	20	30/11	44/23	20	33			2.08		P
E.K.	44	F			130/62		84		2369		1.18		P-D
L.F.	26	M			52/8RU						2.04		E
I.P.	38	F			53/5RU						2.04		E
J.W.	32	M			48/25		33				1.94		P
I.W.	31	F			72/32		44				2.16		G
H.T.	48	F	20		47/20	64/30	25	43	129		2.16	2.38	E
A.A.	46	F	23	40	47/23	89/44	34	65	174	410	3.60	3.08	E
C.T.	33	M			94/57	110/62	66	78	1707	1889	1.87	2.00	P-D
J.G.	40	F	17		40/19	92/55	28	66	300	314	1.71		P
A.A.	46	M			37/2RU	57/5RU					2.40		D
A.W.	47	F	23	35	50/20	81/31	32	49			2.53		E-D
M.B.	54	F	24	32	52/23	62/33	36	47	204	246	3.02	3.15	P-D
McD.	27	M	28	46	60/30	118/60	45	84	659	768	3.03	4.86	G
G.O.	38	M			90/42	100/60	56						E
C.F.	43	M			40/18	74/34					2.28	3.62	G-D
G.R.	48	M	40		73/33		51		242		2.50	3.42	G
A.C.	54	F	28	39	78/38	94/48	50	65	552		2.23		G
J.K.	57	M	35		80/43		58		505		1.55		D
J.F.	51	M	35	49	85/40		55				2.01		P
N.B.	21	F			50/5RU						2.56		E
J.T.	28	M	24	40	55/25		35				2.96		E

**P.C.*, pulmonary capillary pressure; *R*, rest; *Ex*, exercise; *P.A.*, pulmonary artery pressure; *P.A.M.*, mean pulmonary artery pressure; *P.A.R.*, pulmonary arteriolar resistance; *C.I.*, cardiac index. Results: *E*, excellent; *G*, good; *P*, poor, *D*, death.

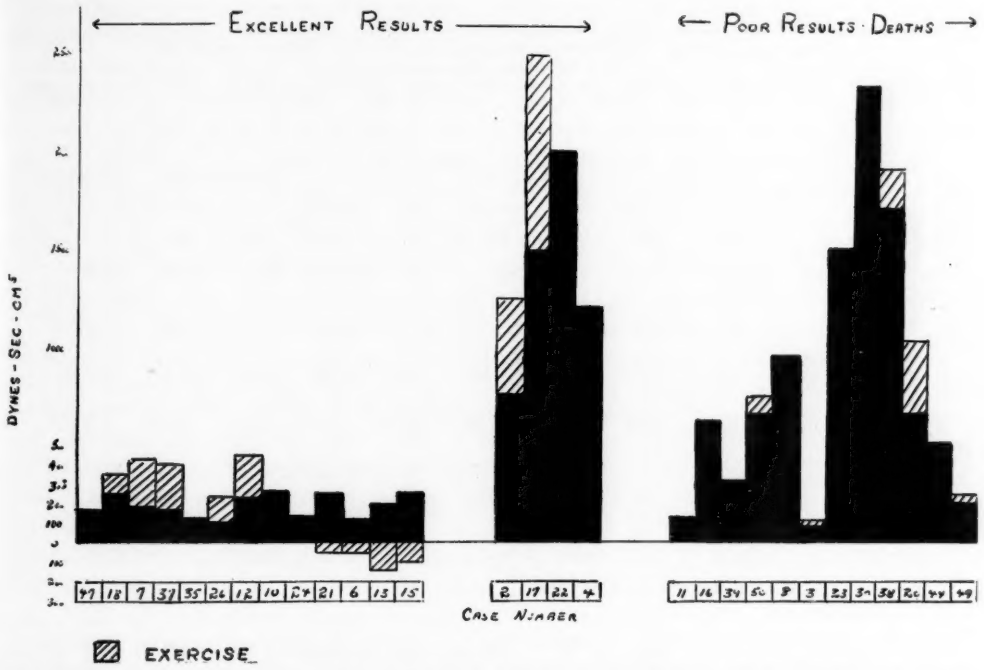

Fig. 3.—Pulmonary arteriolar resistance calculated in 29 cases. Note marked elevation of resting pulmonary arteriolar resistance in cases with poor results as compared to those with excellent result cases.

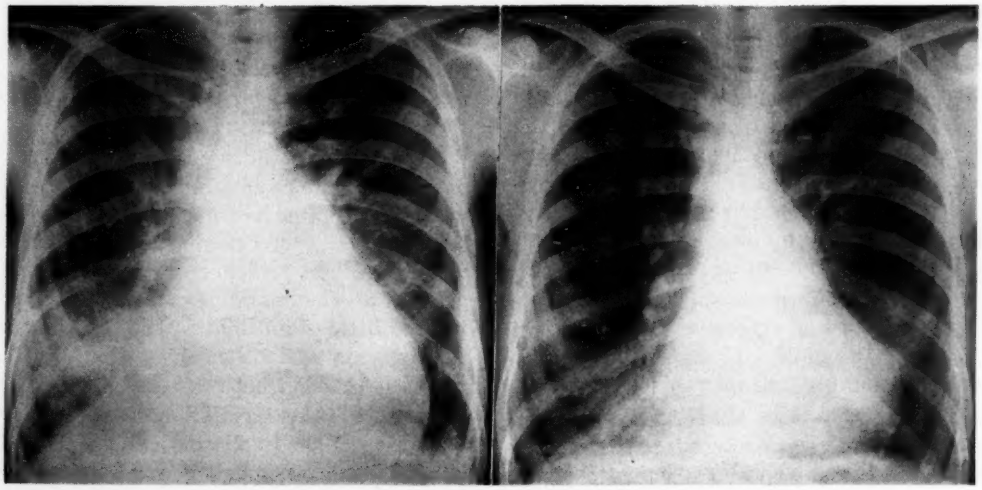

Fig. 4.—Preoperative and postoperative plates in the case of V. L., illustrating changes after successful mitral valvulotomy.

TABLE 2.—*Cardiac Catheterization Data Before and After Successful Mitral Commissurotomy**

Patient	*G.W.*		*G.W.*		*J.H.*		*J.H.*		*J.H.*
Age	*24*		*24*		*38*		*38*		*41*
Sex	*F*		*F*		*M*		*M*		*M*
	Preoperative		*Postoperative*		*Preoperative*		*Postoperative*		*Postoperative*
	Rest	*Exercise*	*Rest*	*Exercise*	*Rest*	*Exercise*	*Rest*	*Exercise*	*Rest*
O_2 consumption	126	226	171	284	133	240	144	368	
Arterial O_2 saturation, %	88.5	93	93.9	95.1	94.4	94.3	96.1	95.0	96.4
Venous O_2 saturation, %	5.6	10.5	4.8	7.6	4.7	10.6	4.54	8.76	3.2
Cardiac output, L./min.	3.52	3.36	5.63	5.89	4.53	6.07	5.09	6.71	9.4
Cardiac index, L/min./M^2	2.26	2.15	3.56	3.73	2.83	3.79	3.18	4.19	5.8
Pressure, mm. Hg.									
P.C.	29	40	13	20	32	54	13	26	
P.A.	99/41	157/51	54/24	96/36	58/29	119/59	34/14	59/28	
P.A. M.	63	92	37	63	43	87	22	46	
R. ventricle	94/11		52/3	69/3	54/6		34/6		35/3
R. atrium	10		6		3		2		
Pulmonary artery resistance (dynes/sec./cm.^{5}	772	1237	341	583	194	434	141	238	
Date	1/31/51		4/4/51		11/14/51		4/11/52		2/2/55

*Note in patient G. W. (a) marked increase in cardiac index; (b) decrease in P.A. pressure, and (c) increase in cardiac output. Note in patient J. H. (a) progressive improvement in cardiac index; (b) decrease in P.A. pressure, and (c) progressive increase in cardiac output.

The result was excellent in 51 cases and good in 19. A poor result was obtained in the cases of 21 patients, 3 of whom, unresponsive to all methods of treatment, died in chronic heart failure, four, seven and eleven months, respectively, after the operation. Nine patients died without leaving the hospital. The detailed summary of these 21 poor results and 9 deaths has significantly influenced our present attitude toward the entire problem.

1. Operation was abandoned for 7 patients because of extensive atrial clotting. Nos. 3, 8, 41 and 56, although hemodynamically acceptable, fell into this group.

2. Operation was abandoned for 4 patients before completely adequate opening of a calcific valve had been obtained, owing to the inability of the heart to withstand the necessary manipulation.

3. Six other patients who had had long-standing illness and had been prepared for operation only with great difficulty continued, after successful operation, in a state of chronic heart failure without response to any therapy.

4. Cardiac disability persisted in 4 other patients after apparently satisfactory valvular opening had been achieved. Sustained fever, precordial pain, a friction rub and other evidence of infection suggested a rheumatic exacerbation that yielded little to antibiotics and only slowly to cortisone and other drug therapy. A constant relation between the microscopic pictures of the cardiac and pulmonary biopsy specimens and this clinical picture has not been established and the precise nature of this relation remains unexplained.[6]

Regardless of the fact that expanding personal experience can reduce and has reduced the high rate of failure cited in categories 1, 2 and 3, the added hazards interposed by these situations cannot be discounted lightly. Such failures might conceivably be obviated in the future by earlier operation. Three patients in categories 2 and 3 died at home three, seven and eleven months, respectively, after the operation.[7]

Death in the hospital occurred in 9 cases.

1. Pulmonary embolism occurred in 2 patients; in 1 on the seventh postoperative day, without valvulotomy but with a clotted atrium, and a second died on the twelfth day after valvulotomy with a clotted atrium and a history of previous amputation for embolization of the femoral artery.

2. In 1 patient, after successful valvulotomy, a clotted appendage saddle embolization was discovered immediately after the operation. Prompt aortic exploration and clot extraction was followed by shock and renal shutdown, with a fatal termination on the fourth postoperative day.

3. One patient, in whom a highly satisfactory mitral valvulotomy had been completed, died on the fifteenth postoperative day, with a pulmonary embolus of uncertain origin. Autopsy demonstrated associated aortic stenosis and insufficiency.

4. One patient with an excellent early result died on the day of discharge from a pulmonary embolus originating in a thrombosed leg vein, to which sufficient attention had not been directed.

5. One patient, having had anoxic damage to the central nervous system, died on the fortieth postoperative day in chronic heart failure, without response to any therapy.

6. Cardiac arrest claimed 3 patients, once during operation and twice in the immediate postoperative period, in spite of all generally accepted methods of treatment. Long-standing chronic disease had truly "beaten up" these hearts. With the common failure of all methods in such emergencies, perhaps a better solution is to avoid it by earlier operation. Furthermore, the uniform inability to resuscitate such patients when the catastrophe occurred during the postoperative period indicates that Harken is sound in suspecting that opening the chests of such patients for intermittent cardiac compression should be carefully considered and done less frequently.

COMMENT

The academic approach made possible by the facilities of a medical center often have provided a sound basis for expanding the use of surgical intervention for a variety of diseases. This certainly is the case with cardiac catheterization, which, although not essential, has permitted more nearly exact delineation of the bounds of good cardiac surgical therapy. Thus, a fair preservation of resting cardiac output, increasing on exercise, and moderate pulmonary hypertension, with variable increases in pulmonary arteriolar resistance, have indicated that such patients are hemodynamically sound candidates for surgical treatment. Others have had excellent results despite markedly increased pulmonary hypertension and arteriolar resistance and with low resting cardiac outputs not increased by exercise. This may be traced to the conversion of right ventricular work to increase cardiac output incident to the reduction in pulmonary hypertension and arteriolar resistance and to perform a successful valvulotomy. In still others abnormally low cardiac outputs, not increased (and in several cases decreased) by exercise, and abnormally high levels of pulmonary hypertension and resistance have been considered

ominous signs. Poor results often have followed operation and may be attributed to (1) a combination of relative irreversibility of pulmonary hypertension and resistance; (2) the inability of the myocardium to recover appreciable functional capacity, and (3) ineffectual valvulotomy. Such contrasts suggest that a patient should not be denied operation purely because of supposedly adverse hemodynamic measurements. On many occasions, particularly in the "poor risk" group, the laboratory workers have strongly recommended the correlation of their studies with the clinical data to facilitate a decision with regard to surgical attack. Since many gratifying results have followed such evaluations, it has been our policy to subject to operation all patients who conform to the commonly acceptable diagnosis criteria and who can be brought clinically to a state consistent with the ability to survive the operation. This experience reinforces our firm conviction that, although cardiac catheterization has enhanced the understanding of the problem, it is no substitute for individual, accurate clinical observation. Thus, many patients have been successfully operated on without the exact measurements of the cardiorespiratory laboratory.

Angiocardiographic study has yielded interesting but often not conclusive results. The inability to predict regularly the presence or absence of atrial or auricular thrombosis and to correlate the size of the pulmonary artery and the degree of hypertension has been disappointing. The ease of visualizing the cardiac chambers and the lesser circulation has been of great value. Further correlation of both preoperative and postoperative studies gives excellent promise of supplying considerable information not available by other means. The limits of its use certainly have not been exhausted.

Because of wide disagreement as to the advisability of operating on the patient with early mitral disease, further cardiac catheterization studies of such patients might be undertaken with advantage. This suggestion is prompted by the well-known deleterious effects of pronounced overloading of the pulmonary circuit, well illustrated in left to right shunts; e.g., ductus arteriosus[8] and septal defects.[9] With a similar approach the appearance of progressively increasing pulmonary hypertension, denoting a shift of the impact of disease from the pulmonary venous area to the pulmonary arterial area might settle the question as to when such relatively well and asymptomatic patients with mitral disease become candidates for surgical treatment.

Although the response of these patients to any therapy depends upon a vast array of variable and intricate factors, at least four are paramount with regard to those accepted for operation: (1) Ability to obtain adequate opening of the valve; (2) the degree of reversibility of the measured pulmonary arterial resistance; (3) the capacity of the myocardium to recover functionally; (4) the ability to complete the operation without inducing a serious or lethal accident. To an investigator mindful of these criteria, inspection of the results yields significant information. The "excellent" results cannot be attributed to satisfactory valvulotomy alone; they are closely related to the degree of pulmonary arteriolar resistance and the lack of fixation of the resultant hypertension at prohibitive and irreversible levels, as well as to an appreciable functional myocardial reserve. In the 4 patients who had excellent results but exaggerated catheterization data the reversibility of pulmonary resistance and hypertension and the subsequent conversion of surprising right ventricular work capacity to functional myocardial reserve merit much credit. In the group who had poor result or died, a

valvulotomy that was less satisfactory for a variety of reasons, together with an extremely high and relatively fixed pulmonary resistance and hypertension, as well as a failing myocardium to which competence was not restored by operation, accounted for the outcome. In the group with excellent results those factors which preclude effective operation or produce serious or lethal consequences, i.e., clotting, unstable hearts or surgically refractory valves resulting from prolonged conservative treatment, were not present. These observations indicate that early mitral valvulotomy is justified to prevent fixation of pulmonary arteriolar resistance and hypertension at excessive levels before the onset of myocardial damage and other changes that reduce the ease of operation or compromise the results even with a successful operation.

Although it is apparent the incidence of good results from operation for mitral stenosis can be improved by restricting operation to favorable risks, this attitude fails to meet the problem. Critical analytic evaluation of all results is important if any advance is to be made. Experience indicates that this relatively simple and safe procedure can yield a high rate of excellent results in favorable and carefully selected cases. In addition, it suggests that long-continued conservative treatment of mitral stenotic disease may increase the number of patients who eventually fall into the "poor risk" group, and that some of this deterioration may be preventable. Two factors that directly relate the results of surgical treatment to the technical difficulties of its application come readily to mind: (1) the suitability of the valve for thorough, adequate and functional surgical opening and (2) the presence of intracardiac clotting. Although one cannot predict the exact character of any valve preoperatively, earlier operation might bring more patients to the surgeon with valves better suited for valvulotomy. True, this suggestion is made in spite of lack of knowledge of the natural course of the disease in both the surgically untreated valve and the split valve. Few will deny that embolisms of cardiac origin have accounted for an appreciable number of poor surgical results. It appears that several courses are open in the attempt to control this factor. Since widespread atrial clotting has not been observed in patients who have undergone early operation, this approach must be given thorough consideration in any attempt to improve results. With long-standing disease, the patient having progressed to the "poor risk" category, one must anticipate an increase in catastrophies of embolic origin. Under such unfavorable circumstances the use of anticoagulant agents over a long period, both in the preoperative and in the postoperative stage of the disease, as suggested by Wright, Harken and others,[11] must be seriously considered. In our experience the character of the valve and the question of emboli have been prominent factors in the results obtained and must be given thorough consideration in any attempt to improve results.

The sudden or relatively rapid cessation of effective cardiac activity remains an imposing problem. A multiplicity of therapeutic methods have been recommended, none of which have proved routinely successful. Since the majority of such accidents have occurred in patients with severely damaged hearts, it occurs to us that earlier operation might have been a better solution than the use of drugs and other methods in the attempt to salvage such severely damaged hearts.

CONCLUSION

From the authors' experience the following conclusions seem reasonable: Rheumatic heart disease often leaves as its major insult a mechanical defect in the form

of pure or relatively pure mitral stenosis. This defect may, in time, result in further insult to the heart in the form of (a) increased pulmonary arteriolar resistance, (b) pulmonary hypertension and (c) a damaged myocardium which progressively dissipates its work in overcoming resistance rather than augmenting cardiac output. These changes ultimately reach a point of irreversibility, when all treatment is palliative. During the developmental stage, which may extend over years and is probably related to the degree of stenosis, protracted illness with progressive cardiac disability is the rule.

Before the advent of the surgical approach, medical measures did much in the relief of symptoms and the prolongation of life. The record of valvulotomy, however, indicates that this high cost in human suffering and life may be significantly reduced if the operation is performed at an early date on all patients who conform to the clinical entity of mitral stenosis, with symptoms.

ZUSAMMENFASSUNG

Die Verfasser glauben, aus ihren Erfahrungen folgende Schlussfolgerungen ziehen zu koennen:

Die rheumatische Herzerkrankung hinterlaesst haeufig als Hauptschaedigung einen mechanischen Defekt in Form einer reinen oder verhaeltnismaessig reinen Mitralstenose. Im Laufe der Zeit kann dieser Defekt zu weiteren Herzschaedigungen fuehren, und zwar a) zu erhoehtem Widerstand in den Lungenarteriolen, b) zu Hochdruck in den Lungen und c) zur Schaedigung des Herzmuskels, der seine Arbeitskraft mehr und mehr zur Ueberwindung des Widerstandes anstatt zur Vergroesserung des aus dem Herzen ausgepumpten Blutvolumens verschwendet.

Ist die Behandlung eine rein palliative, so erreichen diese Veraenderungen schliesslich einen so hohen Grad, dass sie nicht mehr rueckgaengig gemacht werden kennen. Im Stadium der Entwicklung dieser Veraenderungen, das sich ueber Jahre hinaus erstrecken kann und wahrscheinlich zum Grade der Stenose in Beziehung steht, kommt es im allgemeinen zu einem sich lange hinziehenden Krankheitszustand mit fortschreitender Herzschwaeche. Vor der Einfuehrung chirurgischer Behandlung trugen medizinische Massnahmen erheblich zur Milderung der Symptome und zur Verlaengerung des Lebens bei. Die Erfahrungen mit der Klappendurchschneidung zeigen jedoch, dass die Opfer an Leiden und Einbusse der Lebensdauer sich erheblich verringern lassen, wenn die Operation bei allen Kranken, deren Symptome der klinischen Einheit einer Mitralstenose entsprechen, in einem fruehen Stadium ausgefuehrt werden.

RIASSUNTO

Gli autori, in base alla propria esperienza, sono giunti alle seguenti conclusioni.

La malattia reumatica determina come principale residuato una lesione meccanica del cuore sotto forma di stenosi mitralica pura o quasi pura.

Tale lesione conduce ad alterazioni secondarie consistenti in a) aumento delle resistenze arteriolari nel polmone; b) ipertensione polmonare; c) sofferenza del miocardio che deve impiegare le sue energie per vincere le resistenze incontrate più che per aumentare la gittata.

Tutto ciò conduce, a lungo andare, ad uno stadio irreversibile in cui ogni cura diviene palliativa. Durante la fase preparatoria, che può durare anni in rapporto al grado della stenosi, l'insufficienza cardiaca progressiva è la regola.

Prima che si pensasse alla possibilità di intervenire chirurgicamente, la terapia medica si dimostrò efficace nel migliorare le condizioni dei malati e prolungarne la vita. I risultati della valvulotomia, tutta-

via, dimostrano che le sofferenze di questi malati possono essere più sensibilmente ridotte se l'intervento venga eseguito in uno stadio precoce della malattia.

RESUMEN

De cauerdo con la experiencia de los autores parecen derivarse las siguientes conclusiones:

La enfermedad reumática del corazón frecuentemente deja como una secuela mecánica de importancia un defecto en la forma de estenosis mitral pura o relativamente pura. Dicho defecto puede, de acuerdo con el tiempo, producir una perturbación cardíaca mediante: (a) un aumento de la resistencia arteriolar pulmonar, (b) una hipertensión pulmonar y (c) una lesión en el miocardio que desarrolla un trabajo para vencer una resistencia más que para producir un débito cardíaco. Estos cambios alcanzan finalmente la irreversibilidad en la cual todo tratamiento es paliativo. Durante la fase de desarrollo, que puede durar años y probablemente se encuentra relacionada al grado de estenosis, la regla es una perturbación cardíaca progresiva con desarrollo de invalidez. Antes de que apareciera el recurso quirúrgico, los recursos médicos ayudaron mucho al alivio de los síntomas y a la prolongación de la vida. Sin embargo, los registros de la valvulotomía indican que los efectos que sobre la vida produce la estenosis mitral puede reducirse en forma significativa si la operación se utiliza más precozmente en todos los pacientes que presentan la entidad clínica de una estenosis mitral.

RÉSUMÉ

D'après l'expérience de l'auteur les conclusions suivantes semblent raisonnables:

La maladie rheumatique du coeur fait souvent un défaut mecanique en forme de sténose mitrale pure ou rélativement pure. Ce défaut peut produire plus tard du dommage en forme de a) résistence artériolopulmonaire augmentée. b) hypertension pulmonaire and c) dommage au myocarde qui épuise progressivement sa force en surmontant résistence au lieu d'augmenter la quantité de discharge cardiaque. Enfin ces changes deviennent irréversibles, si le traitement entier est palliatif. Pendant la période de développement, qui peut durer des années et probablement dépend du degré de retrécissement, on trouve regulièrement une maladie trainante, suivie d'infirmité cardiaque progressive. Avant l'avenir du traitement chirurgique les traitement medicaux n'étaient pas très effectifs pour relever les symptomes et prolonger la vie. Mais le registre des valvulotomies indique que ce prix cher de souffrance et vie humaine peut être reduit considérablement, si l'opération est faite assez tot à touts les malades dans la catégorie de sténose mitrale avec symptomes.

The authors are indebted to Drs. Daniel S. Lukas and Israel Steinberg for their great aid in the cardiac catheterization and angiocardiographic studies.

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A diarist is always secretive, for if others knew his habit, he would be left more lonely than a cloud. His enemies would regard him as a serpent in the grass; his friends would fear he was writing their epitaph. In the freedom of his solitude, unrestrained by fear of libel or broken bones, there is no knowing what he may be saying, and though it is true, as Mr. Ponsonby says, that no editor can be trusted not to spoil a Diary, yet the stuff is sure to come out in naked completeness some time or other, just as Pepys's has come out. Criticism on friends is sure to be a part of every Diary, and even enemies do not escape. Records of moods and opinions which may have been transitory as the day are stuck in the Diary, as unalterable as mummies in a museum, and one cannot protest to future generations, "Oh, come! I did not mean that so seriously."

—*Nevison*

Chordotomy for Parkinsonian Tremor*

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LONDON, ENGLAND

ONE of the patients whose record appears in Parkinson's monograph[1] had cerebral apoplexy and immediately lost the tremor on the hemiplegic side. This observation, together with the knowledge that section of the pyramidal tract in monkeys causes little or no lasting disability, led Putnam[2] to divide the crossed pyramidal tract at the second cervical level for unilateral tremor (Fig. 1). Of 22 patients, 15 showed reduction of tremor, and most of the patients recovered from the postoperative hemiplegia. Putnam's minimum follow-up period was one year. I have performed 76 Putnam operations, the results of which are indicated in the accompanying table.

A successful result implies that *in the patient's opinion* worthwhile *reduction* in the amplitude of the tremor has been accomplished. Complete elimination of tremor by this operation has been exceptional in my experience. Reference to the table shows that patients with bilateral manifestations of the disease have little prospect of relief from treatment by pyramidotomy, although those with unilateral tremor have a 50 per cent chance of considerable improvement. *Patients who, after chordotomy, showed evidence of damage to the spinothalamic tract obtained the greatest relief.* It was this last observation that led me eventually to divide the whole of the lateral column in an attempt to abolish unilateral tremor completely.

Complete Section of the Lateral Column (Fig. 2).—This operation[3] is performed on patients with *marked long-standing unilateral tremor* and no suspicion of Parkinsonian manifestations in the opposite limbs. Tremor must be the presenting symptom and the patient should be free from psychopathic stigmas. The extensive chordotomy is *never* indicated for patients with the bilateral syndrome.

Technic of the Operation.—The cutaneous incision extends from the external occipital protuberance to the seventh cervical spine. The deep fascia is incised, and the spines and laminae of the second and third cervical vertebrae are denuded with the aid of cutting diathermy. The muscles are separated with self-retaining retractors, and the second and third cervical spines and laminae are removed. The dura mater is incised longitudinally, and its edges are held apart by traction sutures. The arachnoid is then separated from the cord. A No. 15 Bard-Parker blade is clamped in an artery forceps with 5 mm. of the blade projecting beyond the beak of the instrument. The blade enters the cord just cephalad to the attachment of the uppermost sensory rootlet of the third cervical in the direction shown in Fig. 2. The blade penetrates the cord as far as the tip of the artery forceps and is then carried laterally to complete the first part of the incision. The extent of the incision is checked with a blunt instrument. Division of the rest of the lateral column is carried out with a *very thin* blunt-ended tenotome. This instrument is inserted into the first incision and swept forward to complete the section of the lateral column. The extent of the chordotomy is again verified

*This article is published on the occasion of the bicentenary of James Parkinson (1755-1824), physician, palaeontologist, geologist and politician, who in 1817 described the disease that bears his name.[1]

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with a blunt instrument. The wound is then closed.

Immediately after the operation there is total flaccid hemiplegia with a positive Babinski reflex; tremor is absent; there are analgesia and thermanaesthesia on the opposite side, up to a level which usually includes most of the upper limb; Horner's syndrome is always present but eventually disappears. *Temporary* retention of urine occurs in some cases. Recovery from the hemiplegia begins in a few days; it occurs more quickly and more completely in the lower than in the upper limb. All of my patients were able to walk without assistance within three to four weeks. Rigidity, whether of the cogwheel or the leadpipe type before operation, is usually reduced.

REPORT OF CASE

A man aged 33 complained of shaking of the right arm, together with stiffness and occasional shaking of the right leg, of twenty-four years' duration. There was no history of encephalitis. There was marked cogwheel rigidity of the right arm, and the wrist was fixed in full flexion. There was leadpipe rigidity of the right leg. Tremor of the arm was present at rest but *increased with voluntary movement* (in most cases of Parkinson's disease tremor is present at rest and is diminished during voluntary movement, but sometimes, as in this case, tremor was increased during voluntary movement and therefore was a severe handicap as well as an embarrassment). *Complete division of the right lateral column* between the second and third cervical sensory roots was done. Next day a right-sided Horner's syndrome was observed. Some voluntary movements of the right arm persisted, and the right thigh could be flexed. Left hemianalgesia was present up to the nipple. Tremor was completely absent. Twenty-four days after the operation there was still considerable paresis of the hand and fingers, but the patient was able to walk without assistance. A little over a year later there was still no tremor, and although there was some paresis of the right arm the patient was able to earn his living as a waiter. The flexion deformity of the right wrist had completely recovered, as the result of reduction of muscular rigidity. There was some dragging of the right foot. Babinski's sign was positive on the right side, and the left hemianalgesia and thermanaesthesia persisted although the genitalia and the anus revealed normal sensation on both sides. The Horner's syndrome had

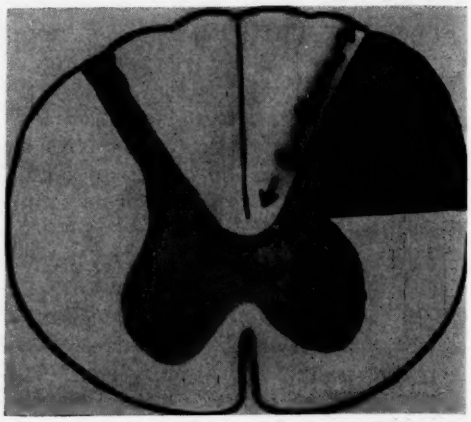

Fig. 1. — Putnam's pyramidotomy. Illustration from *Parkinson's Disease and its Surgical Treatment*, reproduced by permission of the publishers, H. K. Lewis & Co., Ltd., London.

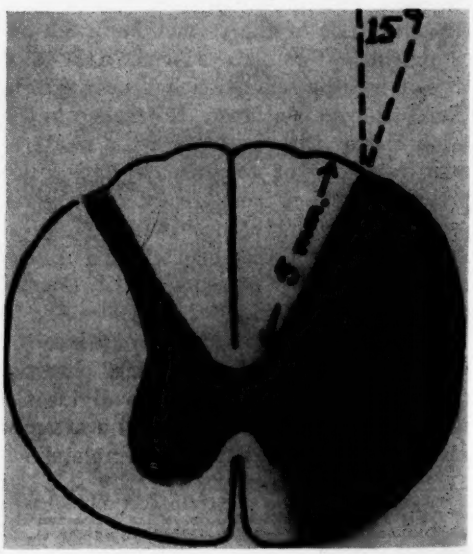

Fig. 2.—Complete section of the lateral column. Illustration from *Parkinson's Disease and its Surgical Treatment*, reproduced by permission of the publishers, H. K. Lewis & Co., Ltd., London.

disappeared. More than five years later, tremor was still absent and the patient was earning his living as a laborer.

Results.—Unilateral section of the lateral column has been performed on 14 patients. There were 12 successful results and 2 failures. There was no operative mortality. The longest follow-up period was six years and five months; the shortest, three years and six months. Complete abolition of tremor was obtained, and the hemiparesis was much less than might have been expected from previous knowledge of the position and function of the pyramidal tracts.

Sjöqvist[4] has published his experiences with this operation. He reported 11 successful results in a group of 17 cases and stated that, although the majority of his patients were completely incapacitated at the time of operation, 7 were able to return to work afterward. His conclusions with regard to the indications for operation are the same as my own. Le Beau[5] has also reported successful results with complete section of the lateral column.

Results of Chordotomy in Seventy-Six Cases

A. *Unilateral chordotomy for unilateral tremor*			
	Operations	20	
	Successful	10	
	No change	9	
	Worse	1	
	Deaths	0	
B. *Unilateral chordotomy for the worse side*			
	Operations	24	
	Successful	2	
	No change	13	
	Worse	9	
	Deaths	0	
C. *Bilateral chordotomy for bilateral tremor (two stages)*			
	Operations	10	(5 patients)
	Successful	1	(patient)
	No change	1	
	Worse	1	
	Deaths	2	
D. *Bilateral chordotomy for bilateral tremor (one stage)*			
	Operations	20	
	Successful	3	
	No change	6	
	Worse	9	
	Deaths	2	

SUMMARY

Experience with Putnam's pyramidotomy (section of the *posterior half* of the lateral column) shows that 50 per cent of patients operated on for unilateral tremor obtained worthwhile reduction in the amplitude of the tremor.

Complete abolition of unilateral tremor is obtained only after section of the *whole* of the lateral column.

Neither operation is suitable for patients with bilateral manifestations of the Parkinson syndrome.

ZUSAMMENFASSUNG

Erfahrungen mit der Putnamschen Pyramidotomie (Durchschneidung der *hinteren Hälfte* des Seitenstranges) zeigen, dass 50% der wegen einseitigen Zitterns operierten Kranken eine lohnenswerte Herabsetzung der Amplitude des Tremors erfuhren.

Völliges Verschwinden des einseitigen Zitterns lässt sich nur nach Durchschneidung des *ganzen* Seitenstranges erzielen.

Für Kranke mit beiderseitigen Erscheinungen des Parkinsonschen Syndroms eignet sich keine der beiden Operationen.

RIASSUNTO

La piramidotomia secondo Putnam (sezione della metà posteriore del cordone laterale) consente di ottenere una notevole riduzione nell'ampiezza dei tremori unilaterali nel 50% dei casi operati. La scomparsa completa del tremore unilaterale si ottiene solo dopo sezione dell'intero cordone laterale, mentre l'intervento non è attuabile nel Parkinsonismo con manifestazioni bilaterali.

RÉSUMÉ

L'expérience avec la pyridectomie de Putnam (section de la partie postérieure de la colonne interne) montre que 50% des malades opérés pour tremeur unilatéral ont obtenu une réduction satisfaisante de l'amplitude du trémeur.

L'abolition complète du tremeur unilatéral est seulement obtenue apres la section complète de la colonne latérale. Aucune opération est applicable aux malades avec des symptomes bilatéraux de la maladie de Parkinson.

RESUMEN

La experiencia obtenida con la piramidotomía de Putnam (sección de la *mitad posterior* de la columna lateral) muestra que el 50 por ciento de los pacientes operados por temblor unilateral presentan una reducción apreciable en la amplitud del temblor.

La abolición *completa* del temblor unilateral se obtiene únicamente mediante la sección *completa* de la columna lateral.

Ninguna de las dos operaciones es adecuada para los pacientes con manifestaciones bilaterales de síndrome de Parkinson.

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A society that gives to one class all the opportunities of leisure, and to another all the burdens of work, dooms both classes to a partial spiritual sterility: for one of the main tasks of life is to keep the inner world and the outer, the spiritual and the practical, in constant and rhythmically related activity.

The practical moral to be drawn from this is that servile labor—even if it produces necessities—should be minimized to the utmost, and that leisure must be distributed more universally in the form of a shorter working day, instead of being permitted to exist as the penalizing burden of "unemployment." Without leisure, there can be neither art nor science nor fine conversation, nor any ceremonious performance of the offices of love and friendship. If our Machine Age has any promise for culture, it is not in the actual multiplication of motor cars and vacuum cleaners, but in the potential creation of leisure. But so long as "comfort" and not life is our standard, the Machine Age will remain impotent.

—*Mumford*

Treatment of Problem Fractures of the Vertebrae

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WE wish to discuss briefly the treatment of problem fractures of the cervical, dorsal and lumbar vertebrae. These fractures are not the simple, mild or moderately severe compression type of fracture of the vertebral body. Mild or moderate compression fractures of the body of the vertebra in dorsolumbar and lumbar areas were reduced by obtaining complete hyperextension by the automobile jack method. For the slender patient a plaster jacket affords sufficient immobilization. For the obese patient the plaster jacket must extend downward to include one thigh. This jacket spica will not slide up or allow the patient to lose the hyperextension obtained. For fractures of the third, fourth and fifth lumbar vertebrae, the immobilization must include one or both thighs. With slender persons, bed rest is maintained until the symptoms subside; with others it is maintained for eight weeks. Immobilization is continuous for five months.

The problem fractures of the vertebral body are as follows: 1. Compression fractures of the explosion type, without fracture of the posterior elements. 2. Compression fractures associated with fractures of the posterior elements of the vertebral arch. 3. Fractures associated with dislocation of a vertebra, with or without locking of the facets; and 4. Fractures associated with soft tissue complications, secondary to damage of the spinal cord.

The soft tissue complications are urologic, neurologic or both. They may be temporary, long-lasting or permanent.

The inability to void occurs frequently. Paralysis of the bladder is associated with motor paralysis of the extremities. The urologist is needed to treat this condition.

In many cases subjective girdle pain occurs with or without objective sensory changes at the fracture site. Hyperesthesia is a common objective sensory observation. Paralyses ranging from part of an extremity to total quadriplegia may occur. Total loss of sensory and motor power, corresponding to the level of injury, usually means complete transverse myelitis due to destruction of the spinal cord. The neurosurgeon is needed to treat this condition.

In my opinion there are two types of neurologic complication that indicate an early laminectomy. The first is the vertebral fracture that comes to the hospital without paralysis but is later associated with it. This is usually due to hemorrhage. The second is the fracture of the vertebral body that has multiple fragments with involvement of the posterior elements, with bony spicules visible within the area by the spinal cord. Some surgeons may wish to perform an exploratory operation in all cases in which clinical transverse myelitis is present; others may not wish to explore in any case.

It is best to discuss these problem fractures of the vertebral body under the types originally listed.

Type 1: Compression fractures of the explosion type. I like this name because it gives a word picture of this extremely comminuted fracture with multiple frag-

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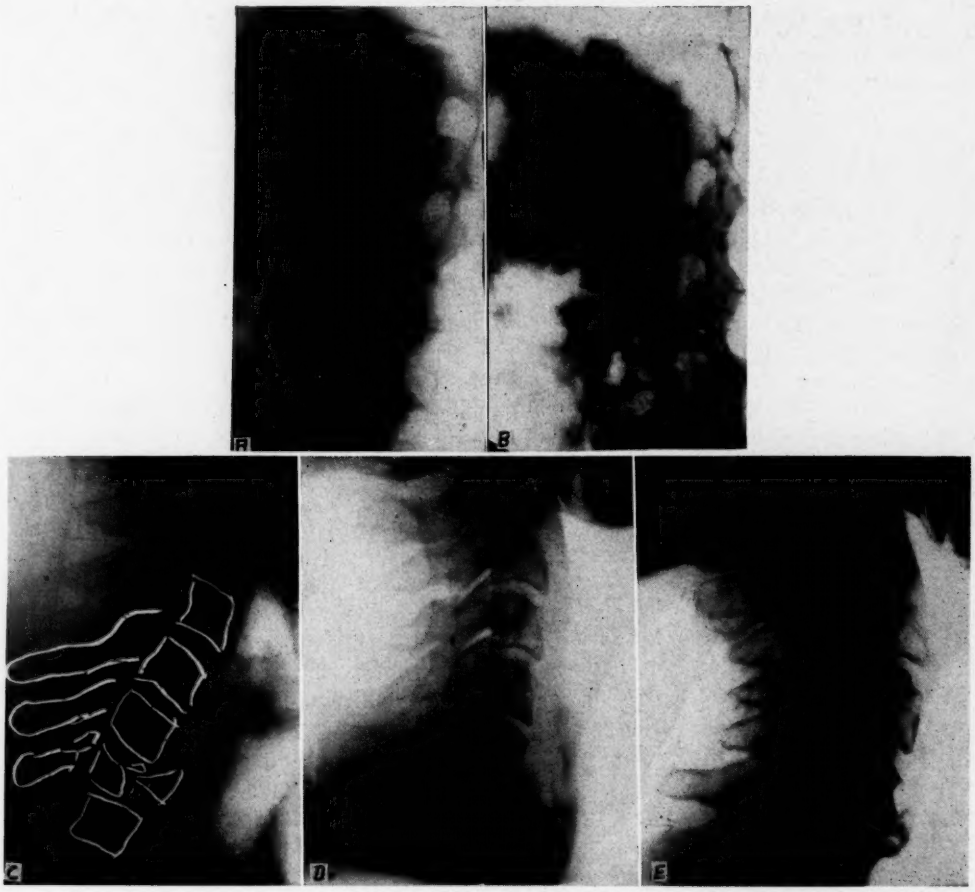

Fig. 1.—*A*, and *B*, case of McG. *A*, lateral view of lumbar portion of spine, showing compression fracture of first lumbar vertebra without involvement of posterior elements. Preoperative film taken March 19, 1952. *B*, postoperative view taken February 26, 1954. *C*, *D* and *E*, case of R. A., a physician. *C*, lateral view of cervical portion of spine showing explosion compression fracture of sixth cervical vertebra with involvement of posterior elements. Preoperative film taken August 12, 1932. *D*, postoperative lateral view taken August 15. *E*, lateral view taken twenty-two years after injury, December 8, 1954.

ments. The displacement occurs anteriorly and posteriorly, lateral to either or both sides, with compression from above downward. In cases of this fracture the roentgenograms must be studied to determine whether the posterior elements of the vertebral arch are intact or disrupted as in Type 2.

Treatment depends upon the integrity of the posterior arch. When the arch is intact, complete hyperextension produces reduction, which is then maintained by spica jacket immobilization in plaster from the manubrium of the sternum to the knees. I use the automobile jack method to obtain hyperextension.

Type 2: Compression fractures associated with fractures of the posterior elements of the vertebral arch. These fractures are frequently comminuted, with

multiple fragments. The roentgen picture must be studied to confirm the fractures of the posterior elements. Malalignment of the facets, loose fragments of bone and visible fracture lines help to show the extent of the damage present.

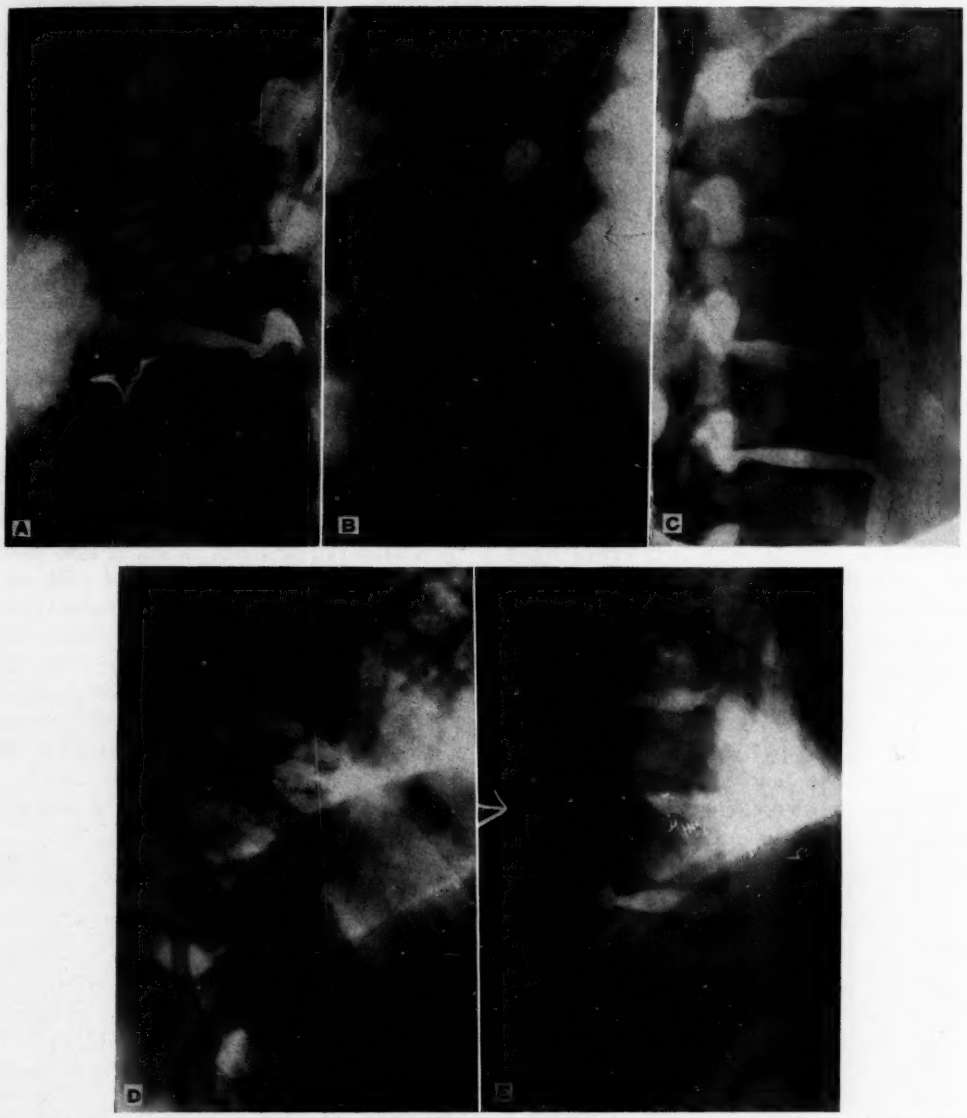

Fig. 2.—*A*, *B* and *C*, case of J. M. *A*, lateral view of lumbar portion of spine, showing explosion fracture of second lumbar vertebra without involvement of posterior elements. Preoperative film taken April 29, 1946. *B*, postoperative lateral view, April 30. *C*, lateral view taken eight years after the operation, November 26, 1954. *D* and *E*, case of J. S. *D*, lateral view of dorsolumbar portion of spine, showing fracture dislocation of twelfth dorsal vertebra with involvement of posterior elements. Preoperative film taken January 1, 1940. *E*, postoperative lateral view taken January 3.

Fig. 3 (Type 2).—Case of M. C. *A*, lateral view of lumbar portion of spine showing explosion fracture of first lumbar vertebra with involvement of posterior elements. Preoperative film taken Aug. 5, 1939. *B*, postoperative lateral view taken August 12. *C*, end result; lateral view taken April 21, 1941.

The treatment of fractures that involve the posterior elements must be somewhat different. Hyperextension *first* can produce permanent damage to the cord when this is not already present. These fractures can be reduced by *first*, traction and distraction in line with the body, and *only then* by *some* hyperextension. Immobilization is by spica plaster jacket.

Type 3: Fractures associated with dislocation of the vertebra, with or without locking of the facets. Fractures of this type occur most frequently in the cervical portion of the spine and also in the dorsolumbar arch of the spine. Closed reduction may be done in some cases by traction and manipulation; open reduction will be necessary in others.

In the cervical portion of the spine, many fractures that can be reduced by closed methods cannot be kept in reduction until healing occurs. The extensive damage to the soft parts posteriorly allows the articular facets to ride upward to their upper limits. This results in a deformity. It is my conviction that in all such cases open reduction and spinal fusion should be done. The fusion is of the Hibbs type. Cancellous bone from the ilium is used, together with *internal mechanical fixation by some method.* External immobilization by a Minerva or Calot jacket is also used.

Type 4: Fractures associated with soft tissue injury, i.e., injury to the spinal cord. It is important here to state that with some cervical or dorsal injuries to the spine there is no demonstrable roentgen evidence of a fracture, although the patient has clinical transverse myelitis. At laminectomy, in each case in which I have explored, fractures of the facets and posterior elements were present.

Fractures that produce lesions of the spinal cord need teamwork in treatment. The question of "to do or not to do a laminectomy" is always present. I have already stated my two definite indications for this operation. In hope of helping the patient, someone sooner or later explores the spinal cord. Damage to the cord produces permanent paralysis. Paralysis due to hemorrhage or pressure from bony spicules can be relieved by operation.

The osseous bony deformity due to the fracture should be reduced and fixed by some method in all cases.

The treatment of fractures of Types 1, 2 and 3 in plaster is continuous for *nine months*. Bed rest for Types 1 and 2 is maintained for four to six months, depending on the comminution present. Bed rest for Type 3 is maintained for two months.

The paralytic ileus associated with these fractures is controlled by the use of prostigmine 1:2,000, injected every three hours for eight doses. Administration of the drug is started on the patient's admission to the hospital. In this way the intestine

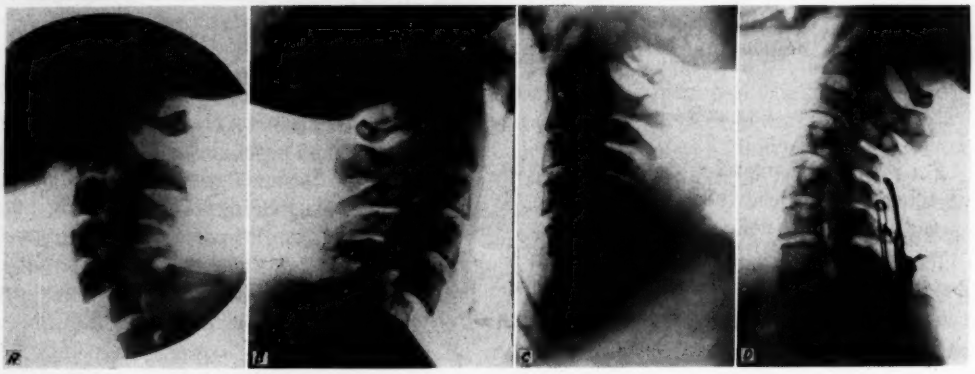

Fig. 4 (Type 3).—Case of B. H. *A*, lateral view of cervical portion of spine showing fracture dislocation of fifth cervical vertebra on sixth. Preoperative film taken Sept. 18, 1937. *B*, another case of B. H. Preoperative film taken April 14, 1951, showing aforedescribed conditions with locked facets. *C*, lateral view after reduction of dislocation, taken April 14, 1951. *D*, lateral view after fusion, taken Dec. 2, 1951.

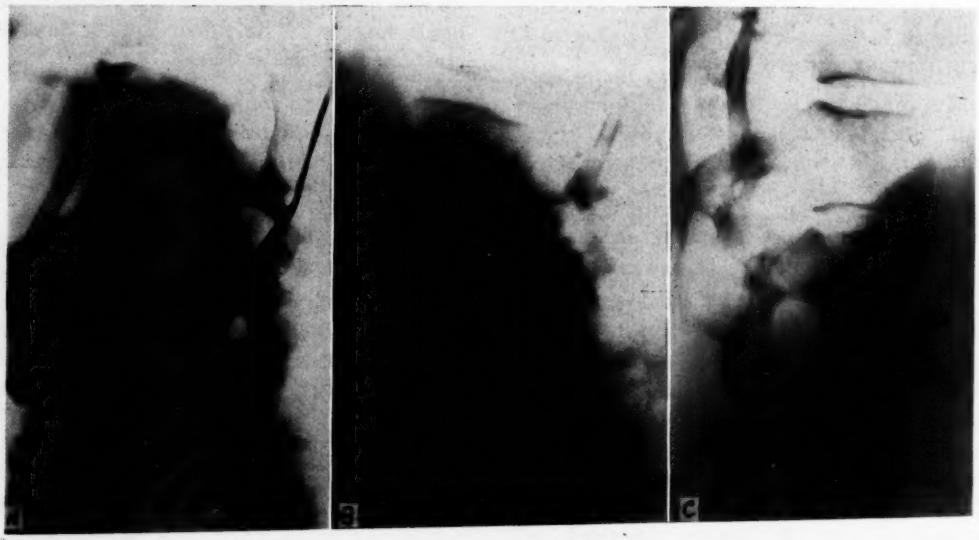

Fig. 5.—Case H. A. *A*, lateral view of lumbar portion of spine showing fracture of first lumbar vertebra *(not the type of fracture discussed in this paper)*. Preoperative film taken May 18, 1936. *B*, postoperative lateral view taken May 21. *C*, end result; film taken December 10.

is not allowed to distend at any time, and thus the symptoms of ileus are reduced.

Physiologic back extension exercises and bilateral quadriceps setting exercises are done 30 times an hour from the day after reduction until the patient is discharged.

The plaster appliances are changed as needed when they become soiled or loose.

CONCLUSIONS

Four types of problem fractures of the vertebrae are described. Treatment of each type is outlined.

Prolonged continuous immobilization is needed to maintain reduction. Laminectomy has a limited use in treatment of these injuries.

RIASSUNTO

Vengono descritti 4 tipi di frattura vertebrale, con i rispettivi metodi di cura. L'immobilizzazione continua prolungata è indispensabile per mantenere la riduzione, mentre la laminectomia trova impiego in un limitato numero di casi.

RESUMEN

Se describen cuatro tipos de fracturas vertebrales señalandose el tratamiento para cada uno de ellos.

Se requiere una inmovilización continua y prolongada para mantener la reducción. La laminectomía tiene un uso limitado en el tratamiento de estas lesiones.

ZUSAMMENFASSUNG

Es werden vier Arten problematischer Wirbelbrüche beschrieben. Die Behandlung jedes dieser Typen wird umrissen. Zur Erzielung einer Einrichtung der Brüche ist eine langdauernde Ruhigstellung notwendig. Die Laminektomie hat in der Behandlung dieser Verletzungen nur ein begrenztes Anwendungsgebiet.

RÉSUMÉ

Quatre espèces de fractures vertrébrales problématiques sont décrites. Le traitement de chaque type est explique.

L'immobilisation continue, prolongée est nécessaire pour maintenir la réduction. La laminectomie est de valeur limitée dans le traitement de ces lesions.

If then race prejudice can be reduced to its simplest, unmixed terms, if it is the liking of those only who are like ourselves, the overcoming of race prejudice depends on educating the masses of mankind to appreciate, and thus to love, that which is unlike themselves. Among the educated class this has to some extent already been achieved. The literature of France, the music of Germany, the profound philosophy of India, the ceramic and pictorial art of China, the utmost perfection of which has only recently been revealed — all these are regarded by educated persons as enrichments and supplementations of their own national genius. The enjoyment of all that is diverse in the life manifestations of the various groups of mankind is one solvent of the problem of race prejudice.

—*Adler*

Care of Simple and Compound Facial Injuries

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FACIAL injuries of all degrees are a constantly recurring source of the perplexing problems that befall most surgeons. One must have a clear concept of these basic problems to deal with them successfully, and we have elected to present such a concept by discussing (a) the general principles and considerations involved in the overall problem and (b) the procedures one uses when certain specific structures are concerned.

Generally speaking, the time element is extremely important. The optimum time to start appropriate treatment is as soon as possible after the injury has occurred. This is elementary, but too often a delay of hours has intervened through no fault of the patient, the injury being attended at the convenience of the surgeon. We realize that under certain conditions, e. g., when war injuries must be dealt with, definitive treatment cannot be instituted immediately. Even in such circumstances, however, certain fundamental surgical principles should be applied to give the patient the best chance for minimal functional and cosmetic impairment. At the time of the original examination, after shock has been treated, hemorrhage controlled and an adequate airway established, a thorough inspection of the overall problem should be made, the amount and extent of tissue damage evaluated, the modes of bony reduction and fixation planned, and the method of choice for repair of the soft parts determined.

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The type of anesthetic depends upon the patient's general condition, the type and degree of injury and the facilities available. Intratracheal, intravenous and local block, infiltration—all are most efficacious, their choice depending on the problem at hand.

Preparation of the field surrounding the injured area should be as thoroughgoing and efficient as if one were proceeding with a clean surgical injury. This is done with pure, white soap, ether, occasionally aqueous merthiolate and a copious gentle lavage of the wound with physiologic solution of sodium chloride.

We prefer an adequate, conservative débridement of contaminated facial wounds, with reduction and immobilization of fractures, followed by immediate closure, to the more radical débridement with the consequent open facial wounds. The rich blood supply in this area is a definite factor in salvaging tissue. Our technic has given good results, and since the addition of chemotherapy to our resources we have been still more confident of pleasing end results.

After débridement, primary wound closure is effected. This is an accurate repositioning of all injured tissues to their respective normal places, with a minimum of fine suture material. The elimination of all dead spaces and accurate hemastasis are important: if hematomas are present, they militate against clean wounds and primary healing. The skin is closed without drainage, except in rare instances, with the finest atraumatic suture. Closure should be without tension, and one should

be sure to allow for the inevitable postoperative edema. In dealing with all surface injuries, unless decidedly contraindicated, we effect immediate epithelial covering for all denuded areas—this is a *sine qua non* in a reconstructive operation.

The type of external dressing, wet, dry or greasy, depends on the type and location of the wounds and the time elapsed since injury, as well as the age of the patient. Children do best with nonadherent, or greasy, dressings. When these dressings are large and adequate they act as an external splint, greatly reduce pain and promote early healing. When there has been epithelial loss and closure cannot be obtained without undue tension, a rotation flap, a transposed flap or a free graft is used, depending on the problem at hand. It is a foregone conclusion that an atraumatic technic is a prerequisite if one is to obtain primary healing and good end results. This technic is complex, but, generally speaking, it means meticulous attention to the many small details that prevent unnecessary surgical trauma and promote primary union. Postoperative care is an integral part of the overall picture: the surgeon must concern himself with the patient's general body reactions and nutrition, as well as with chemotherapy and wound care for possible hemorrhage, infection or tissue slough.

Delayed primary and secondary closure may be indicated under certain conditions, when a more definitive approach is not possible, but this is a subject outside the scope of this paper.

In addition to the foregoing suggestions, certain of the facial components, because of their complex nature, require specific treatment if one is to obtain the best results.

Special Areas. — Scalp: If the cranial bones are exposed and direct closure of the skin is not possible, an advancing, rotating or transposed flap is used to cover the bony defect, and the donor area is covered with a split skin graft. These flaps carry their own blood supply and protect the underlying bone from necrosis and sequestration. These flaps are designed to place the hair-bearing area in its most advantageous location for later use. In elevating these flaps, one should leave behind the pericranium to protect the underlying bone and to provide a proper bed for the split grafts. Owing to the rich blood supply and the anatomic structure of the scalp, the use of drainage and pressure dressings to prevent hematomas is a routine part of the care of all scalp wounds.

Fig. 1.—*Left*, multiple facial lacerations, one completely through the lip to the infraorbital area. Photograph taken ten days after repair. *Right*, patient eight years after primary repair.

Ear: All portions of badly lacerated ears should be saved if possible, for flaps with small pedicles do surprisingly well, even though there is some question of flap viability. Immediately after the accident, gentle efferent flap massage, performed hourly, is of great value in saving these flaps. Any exposed ear cartilage should be covered immediately with viable skin. If it is attached, one can use the adjacent postauricular and scalp skin for covering. If it is completely detached, the cartilage can be de-epithelized and buried subcutaneously in the appropriate postauricular area for later reconstruction. When hematomas occur they must be drained and the collapsed skin and perichondrium held

Fig. 2.—*Left*, result of emery wheel explosion. Lacerations and fractures extended through soft palate. *Right*, patient after primary repair, with four days' hospitalization.

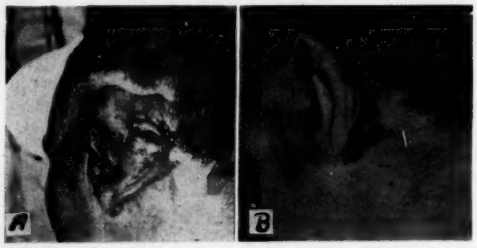

Fig. 3.—*A*, motor accident. Ear detached except for pedicle at lobule. *B*, primary reconstruction. No infection or necrosis occurred.

snugly against the cartilage. This can be done by evacuating the hematomas, establishing dependent drainage and inlaying plaster of paris in the ear convolutions to serve as a cast. Circumferential lacerations of the external canal should be accurately repaired and continual dilatation effected. Skin grafts should replace any loss of skin, particularly if they are circumferential; otherwise troublesome stenosis will occur.

Eyelids: To prevent corneal damage and a resultant ectropion or entropion, accurate apposition of all lid elements must be effected. If the center portion of the upper lid is lost, immediate replacement with a smooth lining and a skin covering must be done to give the cornea its necessary early protection. One must remember that the lining must be smooth and nonirritating and that any sutures used must not lie in contact with the cornea. It may be necessary at times to close the lids together surgically to protect the cornea and prevent contractions of the lids, especially after facial burns in which the lids are involved.

If the nasolacrimal ducts are severed, every effort should be directed toward obtaining primary suture of the ducts, for loss of their continuity is disabling and secondary reconstruction most difficult.

Nose: Lacerations here, as elsewhere, are accurately reconstructed. To prevent intranasal webbing and stenosis after through-and-through lacerations, one must repair the mucosa as well as the skin covering. Nasal fractures are reduced immediately, or within the first three or four days. Delay interferes with proper bony restoration. The majority of these fractures are (1) depressed; (2) fractured to the left, and (3) fractured to the right. A simple procedure to accomplish reduction consists of (a) elevation of the nasal bones and the fractured septum; (b) reduction of the fractured nasal processes of the maxillae, inward or outward, as indicated, and (c) digital molding to center the nose. It is our own opinion that even though cerebrospinal fluid drains through the nose as a result of the severity of the injury, early (one to four days) nasal reduction is not contraindicated. Since the advent of chemotherapy, we have had additional confidence in handling these problems. If sections of the soft tissue of the nose have been lost at the time of injury and can be found, they should be cleaned, "defatted" and resutured into place like free grafts. These do very well indeed and are worth trying. If the whole sections are not found, following débridement, an immediate replacement graft may be employed after débridement; or, if this is not feasible, suturing the skin to the mucosa will speed primary healing and reduce subsequent contractures and deformities.

Face: Lacerations are débrided, accurately repaired and sutured with the finest atraumatic suture material. Too often the immediate repair of the laceration is performed in such a manner that additional scarring, crosshatching and ladder scarring are added to the original defect. These are very troublesome to correct at a later time—sometimes more so than if the wound had been left open and proper secondary suturing instituted. When indicated, in addition to muscle repair, the suturing of severed facial nerves is of the utmost assistance in returning facial function to the norm. These nerves will regenerate in time to supply facial muscle tone and contractions.

Slicing Lacerations. — Débridement should be done, with the edges squared and the opposing tissue elevated into place. Hemostasis should be complete and dead spaces eliminated by suturing the flap bases; then an external pressure dressing should be applied. This should remain in place for at least three weeks. If these principles are followed, a great deal of the contraction and humping of tissue that usually follows this type of wound will be eliminated.

Powder Marks and Foreign Bodies.— These are best dealt with at the time of the original repair. Débridement, irrigation, sanding and scrubbing with a stiff handbrush will go far in eliminating many irritants and foreign bodies. This requires time and patience on the surgeon's part, but if the patient's general condition will allow it this extra work will pay dividends.

If the parotid gland is severed, direct closure of the overlying structures will give excellent results. We have never seen a permanent parotid fistula develop after this type of handling. If the parotid duct is severed, direct suturing is best; if this is not possible, the proximal end of the duct should be surgically placed in the mouth so that a new opening is formed.

Human and Dog Bites. — Bites of the face are handled like other lacerations, except that a *more* thorough débridement is done, puncture wounds are not sutured and nitric acid cauterization is not employed. When indicated, however, the specific chemotherapeutic agents and Pasteur's treatment are employed.

Facial Burns. — These are given the same prompt general and local treatment provided for burns in other areas. Specific attention to the eyes and lids is mandatory:

1. The eyelids should cover and protect the cornea at all times. If the damage is so great as to cause loss of the eyelid, the remaining portions should be surgically joined at once, or a covering flap or graft should be applied for corneal protection.

Fig. 4.—*A*, electric burn of mouth. *B*, result of first repair, one and one-half years after the injury. Later revision is contemplated.

Fig. 5.—*A* and *B*. Bilateral fracture of maxilla with internal fixation. Dental arch to zygoma.

2. For local care of a burn wound, the dressing may be open. A paraffin spray or a greasy pressure dressing should be used, depending upon the depth and severity of the burn. It is well to watch burned ears closely, for if the cartilage becomes infected it may be completely destroyed and absorbed, and later otoplasty will be extremely difficult. Grafts for the burned face should match the normal color of the skin and are best obtained from the upper part of the trunk. Generally speaking, the closer the donor area is to the face, the better the skin will match.

Gunshot Wounds.—Kazanjian and Converse stated, "The actual loss of tissue is not too extensive at times, but the exaggerated size of the wound is due to a number of factors, including the retraction of the wound edges by the contraction of severed muscles, elasticity of surrounding skin, the weight of detached flaps of tissue, displacement of fractured bony fragments, local inflammatory reaction or edema." All foreign bodies and powder marks should be eliminated, fractures immobilized and wounds débrided and sutured immediately, if possible; otherwise, within the first few days. In the late phase of wound care one must be on the lookout for hemorrhage and sepsis. When there is loss of soft tissue, suturing of the skin to the mucosa where indicated will do much to aid repair, stop contractions and prepare the field for later reconstruction. Precautions against tetanus and gas gangrene, plus chemotherapy, are routine.

Mouth Wounds. — In our experience, these wounds do best, if after a careful surgical toilette, they are gently sutured. We should like to say one word here about electric burns of the mouth, seen quite frequently in the crawling child. These are ghastly to look at: not only is the area cooked, but the crater-like wound looks as if it had exploded. After gentle cleaning without débridement, one obtains the best results by watchful waiting. This is difficult, as the anxious parents are constantly prodding the surgeon to do something. Our rule is *sit tight*—watch for secondary hemorrhage—do your reconstruction after many months of waiting, and you will obtain the more pleasing end results.

Facial Bones and the Mandible.—When fractures and distortions have occurred, early reduction and immobilization should be done. The manner of doing this depends on the problems at hand, and these have been adequately covered in the recent literature. When either the upper or the lower jaw is involved, teaming with a dental surgeon is highly recommended.

Generally speaking, Kazanjian and Converse stated, after injury in the upper third of the face, death may result from severe intracranial damage. In the middle third of the face, although the damage may be great, it is not necessarily fatal. With wounds of the lower third of the face, one must be on the lookout for respiratory embarrassment and hemorrhage. In their opinion, "the cardinal principles in the treatment of facial maxillary wounds with loss of tissue are: 1. Anatomic positioning of the remaining tissue should be done. 2. When soft tissue is sutured over a bony defect, the anatomic contour should be restored by a prosthetic appliance. 3. The lining as well as the covering should be closed where needed."

ZUSAMMENFASSUNG

Die Verfasser erörtern die Behandlung vieler verschiedener Formen von Gesichtsverletzungen und legen besonderes Gewicht auf die Notwendigkeit sofortigen Eingreifens und sorgfältiger nicht traumatisierender chirurgischer Technik. Sie weisen darauf hin, dass die Fortschritte moderner Chemotherapie dem Chirurgen die Möglichkeit gegeben haben, auch schwierige Wiederherstellungen des Gesichts mit grösstem Vertrauen auf ein gutes Endergebnis zu unternehmen.

RIASSUNTO

Viene descritto il trattamento di vari traumi facciali, sottolineando la necessità di una cura precoce e di una chirurgia meticolosa e atraumatica. L'avvento degli antibiotici ha messo i chirurghi in condizione di operare qualunque lesione della faccia con grandi probabilità di guarigione soddisfacente.

RESUMEN

Los autores tratan sobre el cuidado y tratamiento de las variedades de lesión facial señalando particularmente la necesidad de rapidez de acción y desarrollo de una técnica meticulosa. Establecen que con la quimioterapia moderna el cirujano es capaz de abodar aún las reconstrucciones más difíciles de la cara con una gran confianza acerca del resultado final.

RÉSUMÉ

Les auteurs discussent le soin et le traitement de toutes sortes de blessures de la face. Ils accentuent particulièrement la nécessité de promptitude et d'une technique chirurgicale subtile, non traumatique. Ils constatent que grâce à la chémotherapeutique moderne le chirurgien est capable, d'entreprendre même une opération réparatrice faciale difficile avec beaucoup plus de confidence en ce qui concerne le résultat définitif.

Just now, when everyone is bound, under pain of a decree in absence convicting him of *lése*-respectability, to enter on some lucrative profession, and labor therein with something not far short of enthusiasm, a cry from the opposite party who are content when they have enough, and like to look on and enjoy in the meanwhile, savors a little of bravado and gasconade. And yet this should not be. Idleness so-called, which does not consist of doing nothing, but in doing a great deal not recognized in the dogmatic formularies of the ruling class, has as good a right to state its position as industry itself. It is admitted that the presence of people who refuse to enter in the great handicap race for sixpenny pieces is at once an insult and a disenchantment for those who do. A fine fellow (as we see so many) takes his determination, votes for the sixpences, and, in the emphatic Americanism, "goes for" them. And while such an one is plowing distressfully up the road, it is not hard to understand his resentment, when he perceives cool persons in the meadows by the wayside, lying with a handkerchief over their ears and a glass at their elbow.

—*Stevenson*

Tumor in an Undescended Testicle: Intra-Abdominal Seminoma with Necrosis and Hemorrhage

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MOST reports substantiate the statement that malignant tumors occur more frequently in ectopic or undescended testes than when the testes are in the scrotum.[1] Occasional reports question these conclusions on the ground that malignant testicular tumors are rare and that in the undescended testes they are even rarer, so that present statistics on this supposed relation can be questioned.[1e]

Although approximately 15 per cent of all testes may not have descended at birth, most of the rest descend before puberty, with 0.2 per cent, or 1 in 500, remaining undescended after puberty.[1a] Of the testes that fail to descend normally, 10 per cent are bilaterally undescended, and there is approximately 1 abdominal testis to every 4 inguinal testes.[4d]

Whether or not all undescended testes are potentially subject to malignant change is still controversial.[1c] However, the poor prognosis for all postpubertal abdominal testes as to spermatogenesis, infection, trauma and malignant degeneration suggests that all undescended testes should be brought surgically, at or before puberty, to the scrotum.[1d] Testes that cannot be placed in the scrotum should be removed.

Comparisons of normal and cryptorchid testes have shown that there is defective gonadogenesis in 50 per cent of cases of retained testes and that cryptorchid testes that do not descend at or before puberty show no potentialities for fertility.[1c] Furthermore, a testis left in an intra-abdominal position through nondescent or after an operation has a definite predisposition to become cancerous.[1a]

The incidence of cancer of the normal testis has been reported as 0.0013 per cent, whereas the incidence of cancer of the undescended testis has been reported as 11 per cent.[1b] In one series of patients with cancer of 1 testis and unilateral cryptorchidism, over 97 per cent of the malignant tumors were in misplaced testes.[1h] The frequency of bilateral involvement was 32 times as great when cryptorchidism was present than when the testis was in the scrotum.[1h] It appears that it is wiser to place a cryptorchid testis in the scrotum, if possible, rather than leave a defective testis in an abnormal position.[1a]

Various theories have been advanced to explain the origin of testicular tumors in general and seminoma in particular.[2] Most neoplasms of the testis are malignant, and, although a small number of benign adenomas, fibromas and hemangiomas have been reported, these are rare surgical curiosities.[2f] Since benign tumors can be differentiated from malignant ones only in microscopic examination, all testicular tumors are treated as if they were malignant. Secondary malignant disease of the testes is rare; only 50 cases have been reported in the literature, and in these the disease occurred primarily by retrograde

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extension from the kidney, penis or scrotum via the lymphatic or venous channels.[21]

Seminoma constitutes approximately 50 per cent of all malignant tumors of the testes, with a range of 35 to 67 per cent reported.[3]

Seminomas are relatively less malignant than are other testicular tumors, but, considering the fatal outcome without prompt and adequate treatment of either type, this lessened danger requires adequate treatment to take advantage of this fact.[4]

Seminomas metastasize via the same lymphatic routes as do other testicular tumors, following the spermatic vessels to the retroperitoneal lymph nodes alongside the vena cava and the aorta.[2d] A secondary path is along the iliac vessels. Involvement of the inguinal nodes does not take place unless the scrotum is involved or unless there is a backup from the primarily involved lumbar region. It is because of the route of spread by metastasis that even radical operation, with its considerable mortality rate, is successful only in a small percentage of cases and has been for the most part abandoned.[5] Unlike other testicular tumors, however, seminomas are relatively sensitive to external irradiation.[6] The lethal tumor dose recommended varies from 1,500 r total to 2,500 r by several ports.[7] Surgical removal, or orchiectomy of the involved testis, is successful in a small number of cases, but surgical removal followed by external irradiation has a considerably higher rate of "cure."[8] The size of the tumor has little to do with the presence or absence of metastases, since many tumors 1 cm. or less in diameter have already metastasized. It is generally agreed that trauma has nothing to do with the initiation of the malignant tumor, although severe trauma may facilitate dissemination of the cells.[1i] In a certain number of cases it is trauma that first draws attention to the malignant disease. The prognosis is good with adequate surgical treatment and external irradiation along the lymph pathways all the way up the aortic chain.

Intra-abdominal seminoma excised in a case of undescended testis.

REPORT OF A CASE

A. V., a 42-year-old man was seen at the Quincy City Hospital on March 30, 1952, with a history of generalized abdominal pain for three days. Two days earlier, in the middle of the night, he had been awakened by a severe pain in the left side, with nausea and vomiting. There was no radiation of the pain into the groin or the leg, but there was slight radiation to the right dorsal area. The bowel movements were normal, and no blood was observed. The patient called a physician, who gave him medicine for the pain, and during the rest of the day the patient was quite comfortable. Early the next morning, however, he had another severe pain with vomiting, and the physician then sent him to the hospital.

The patient had had a gastric ulcer for several years, which was treated medically with a special diet. The family history was noncontributory. There were no complaints with regard to the cardiovascular, pulmonary or genitourinary systems.

Physical examination revealed the patient to be well developed and well nourished. He was in no acute distress (probably owing to the medication). There was no anemia,

cyanosis, jaundice or edema. Examination of the head showed the eyes, mouth and throat normal. The pupils were narrow, but they reacted normally. No nodes were palpable in the neck. The thyroid was normal, and the trachea was in the normal position. The lungs and heart were normal. The entire wall of the abdomen was rigid and tender. Even slight percussion elicited tenderness all over the abdomen. It was impossible to palpate masses because of the active and passive spasm. Percussion of the abdomen revealed slight dullness, especially in the right half. On auscultation there were no peristaltic sounds. There were no hernias or glands in the groins. There were no symptoms of free fluid in the abdomen. Examination of the back, spine and extremities gave negative results. There were no testicles palpable in the scrotum. The right testicle was in the right groin, undescended. The clinical impression at this time was that of peritonitis due to a ruptured ulcer, a ruptured diverticulum, a ruptured appendix or an abdominal left testicle with a twisted cord. It was decided that exploratory laparotomy was indicated.

A roentgen examination showed abnormally dilated loops of bowel, apparently both transverse colon and small bowel, in the left upper abdominal quadrant. There was fecal material on the right side of the colon, and there was virtually no gas in the descending colon. There were fluid levels in the left upper quadrant, which were difficult to locate exactly but seemed to be both in the small bowel and in the stomach. The observations were strongly suggestive of obstruction of the small bowel, and reexamination in six to twelve hours was advised.

Operation. — A right midline incision was made through the skin, subcutaneous fat, rectus fascia and muscle, and the peritoneum was split and opened. A small amount of free fluid was present in the peritoneal cavity, with omentum adherent to the pelvis, and this was separated. Palpation revealed a mass in the left side of the pelvis posterior to the bladder, at about the level of the external ring and adherent to the posterior peritoneum, sigmoid and omentum. The adhesions were separated digitally, and the mass was lifted out of the pelvis. It was the size of a small orange and had a pedicle, twisted on itself, about 3 inches (7.5 cm.) long. Two Kelly clamps were applied, and the tissue was cut between them. A ligature was applied to the pedicle with No. 1 chromic catgut and no bleeding was observed. A cigarette drain was put into the pelvis at the site of the mass, and the abdomen was closed in layers with continuous No. 1 catgut to close the peritoneum, interrupted No. 1 catgut to approximate the fascia, and interrupted fine silk to approximate the skin. At the end of the operation the patient's condition was good.

Pathologic Report. — The pathologist reported the gross specimen to be an encapsulated tumor from the left pelvic region, measuring 10 by 4 cm. It was firm and on cross section showed extensive hemorrhage into the mass. The periphery of the growth consisted of pale, firm, slightly yellow-tinged tissue.

Microscopic examination showed a neoplasm that was necrotic and extensively invaded by hemorrhage. The nonnecrotic portion of the specimen was highly cellular. The cells were large and uniform in size, with vesicular nuclei and relatively little stroma composed of delicate fibrillar connective tissue. There were foci suggesting tubercle arrangement, and mitoses were demonstrated. The pathologist's diagnosis was seminoma of the undescended left testicle.

Course.—The postoperative course was uneventful and recovery was rapid. The patient was discharged on the seventh postoperative day. He was further treated with roentgen therapy.

The final diagnosis was "seminoma of the intraabdominal undescended left testis, with torsion of the cord, necrosis and hemorrhage."

A follow-up of three years has shown no evidence of recurrence of metastasis.

COMMENT

This case illustrates several features of a typical seminoma. Its presence in an ectopic undescended left testis, with no symptoms prior to necrosis and hemorrhage, is typical. A history of gastric ulcer seemed to make a diagnosis of perforation a possibility, but the presence of a necrotic and hemorrhagic mass in the left half of the pelvis left the diagnosis up to the pathologist, who reported "seminoma." Recovery of the patient after surgical removal of the tumor and postoperative irradiation, with survival for more than three years with no recurrence, is a good result and promises to be longer-lasting.

SUMMARY

The case is reported of a patient with a history of long-standing gastric ulcer in whom acute disease of the abdomen developed, with nausea and vomiting. It was noted that the patient had cryptorchidism on the right and no testicle on the left. Exploratory operation revealed a necrotic and hemorrhagic mass 10 by 8 by 4 cm. in the left side of the pelvis, at the level of the external ring, with a twisted pedicle. This proved on microscopic examination to be a seminata. Surgical removal plus postoperative external irradiation resulted in good recovery with no recurrence after three years. Routine examination of the scrotum to confirm the presence or absence of the testes is advised for all male patients.

ZUSAMMENFASSUNG

Es wird über den Fall eines Mannes berichtet, der eine lange Vorgeschichte eines Magengeschwürs aufwies und dann eine Baucherkrankung mit Uebelkeit und Erbrechen entwickelte. Es stellte sich heraus, dass der Kranke keinen linken Hoden und auf der rechten Seite einen Kryptorchismus hatte. Die Probeleparotomie ergab eine 1x8x4 cm grosse nekrotische und hämorrhagische Masse im linken kleinen Becken auf der Höhe des äusseren Leistenringes, die einen gedrehten Stiel aufwies. Die mikroskopische Untersuchung erwies ein Seminom. Die chirurgische Entfernung, gefolgt von äusserer Bestrahlung, führte zu völliger Wiederherstellung ohne das Auftreten von Rückfällen innerhalb von drei Jahren. Bei allen männlichen Kranken ist eine Hodenuntersuchung empfehlenswert, um das Vorhandensein oder das Fehlen eines Hodens festzustellen.

RIASSUNTO

Viene riferito il caso di un paziente con una vecchia ulcera duodenale, nel quale comparvero improvvisamente dolori addominali con nausea e vomito. Il paziente aveva una criptorchidia destra e mancava del testicolo sinistro. All'intervento si trovò una massa necrotica ed emorragica delle dimensioni di un uovo, nella pelvi, a livello dell'anello inguinale esterno sinistro, con un peduncolo torto. Si trattava di un seminoma che venne asportato chirurgicamente e quindi irradiato. Si ottenne una guarigione senza recidive per 3 anni. Si consiglia l'esame sistematico dello scroto in tutti i pazienti di sesso maschile.

RÉSUMÉ

On reporte le cas d'un malade qui souffrait depuis longtemps d'un ulcère gastrique et qui fut atteint d'une affection abdominale avec nausée et vomissement. On remarqua, que le malade avait du cryptorchidisme du coté droit et que sur le coté gauche pas de testicule était palpable. Une opération exploratoire révéla une masse necrotique et hémorrhagique de 1 x 8 x 4 cm. sur let coté gauche du pelvis, dont le pedicule était tordu.—La diagnose microscopique était Séminome. L'excision suivie d'irradiation, extérieure résulta en guerison complète sans récidive après 3 ans.—Un examen obligatoire du scrotum est recommandé pour touts les malades masculins, afin de confirmer la presence ou l'absence des testicules.

RESUMEN

Se comunica el caso de un paciente con una historia de úlcera gástrica de larga duración en el cual se desarrollo un padecimiento abdominal con náusea y vómito. La exploración reveló una criptorquidia del testículo derecho y no se observó testículo izquierdo. La exploración exploradora descubrió una masa necrótica y hemorrágica de 1 por 8 y por 4 cms., en el lado izquierdo de la pelvis, a nivel del orificio externo, con un pedículo torcido. El exámen microscópico revoló seminoma.

La extirpación quirúrgica de la tumoración además de la irradiación postoperatoria produjo una recuperación adecuada no presentándose recidiva en un plazo de tres años. Se recomienda le exploración rutinaria del escroto para confirmar la presencia o ausencia de testículo en todos los pacientes del sexo masculino.

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Fractional Pneumoencephalographic Study in the Presence of Intracranial Tumors

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LIMA, PERU

THERE have been several publications about the study of the ventricular system by means of air injection, after Dandy's method. A limited number of publications refer to cisternal study, among which are those by Davidoff, Dyke, Pendergrass, Hamby, Goette, Rosenjagen, Bellon, Masherpa, Alajouaine and Thurel.

Cisternal study has customarily been done by using a moderate quantity of air and obtaining a regular pneumoencephalogram, with the usual disagreeable post-pneumoencephalographic symptoms.

Belloni in 1941, and Frimann, Dahl and Ingebrigtse in the same year, announced a differential study between the cisternal and ventricular systems. Later, Robertson's fractional method appeared, which permitted dynamic study of the cisternal spaces, fissures, sulci and ventricular cavity. The problem was solved in large part by using a smaller volume of air, with easy displacement and rapid absorption.

From the Service of Neurosurgery, Hospital Obrero, Lima. Submitted for publication April 30, 1955.

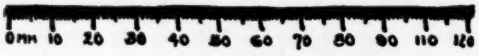


Fig. 1.—Schematic drawing of ventricular system (see text).

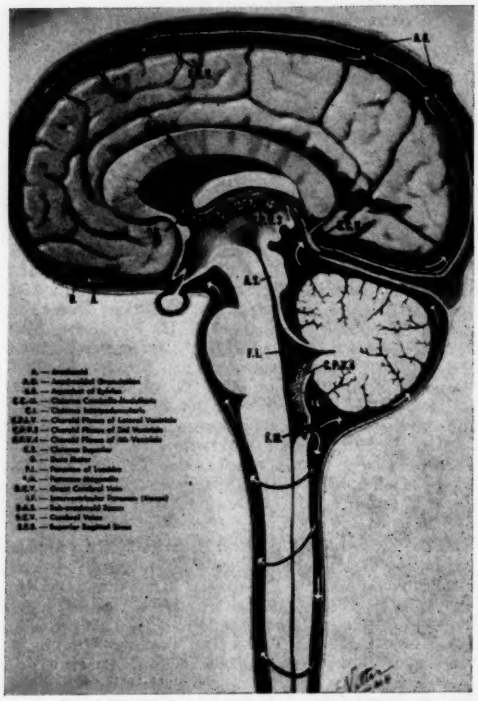


Fig. 2.—Lateral view, showing cisterna and the kinetic nature of the cerebrospinal fluid. (From The Central Nervous System, by Frank H. Netter, M.D.)

In Stockholm, Francisco Castellano and Giovanni Ruggiero developed the method of fractional use of air, assuring adequate visualization of the ventricular and cisternal systems. Ruggiero has been making exhaustive studies in the Ste. Anna Hospital in Paris on the Neurosurgical

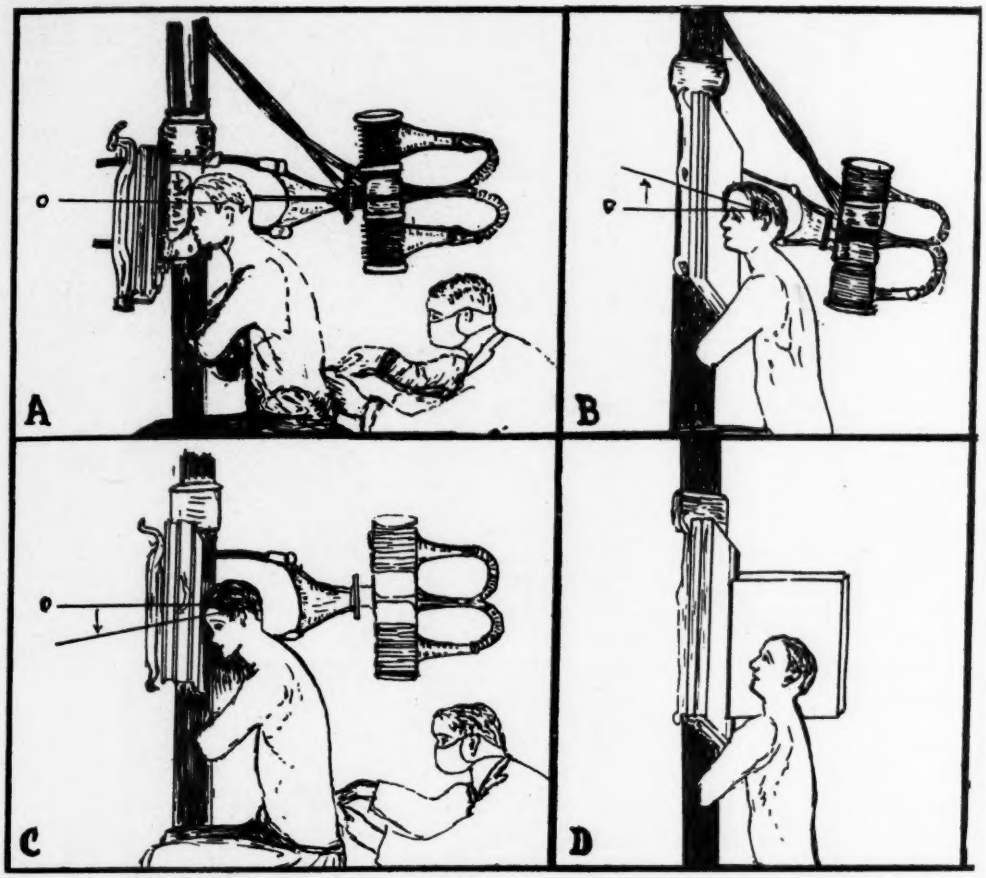


Fig. 3.—*A*, position of the head during injection of air. The head is in the horizontal position or in slight flexion as the air enters the ventricle. *B*, head raised slightly (to an angle of 30 degrees) so that the air may flow into the basilar cisterna. *C*, head inclined 30 degrees downward to allow transmission of the air over the cerebellum and the surface of the brain. *D*, head in hyperextension, insuring passage of the air to the basal cisterna and to the anterior portion of the ventricular system.

Service of Marcel David and the Radiology Service of Fishgold.

Shapiro and Robinson of New Haven, Connecticut, in 1953 referred to the pneumoencephalographic technic of filling the fourth ventricle, adequate and subarachnoid cisterna with a small amount of air.

Anatomic Considerations.—In our study the ventricular and cisternal systems (Figs. 1 and 2) are shown in the diagrams to stress the importance of dynamic visualization of these two systems. In the cisternal system, we could consider two groups: superficial and profound.

1. Superficial: Cisterna cerebelli, cisterna pontis, cisterna chiasmatis and cisterna interpenduncularis.

2. Profound: Cisterna lamina terminalis, cisterna corpus callosum, cisterna ambiens and cisterna sylvii.

In the ordinary pneumoencephalogram, according to Belloni, the cisterna is vis-

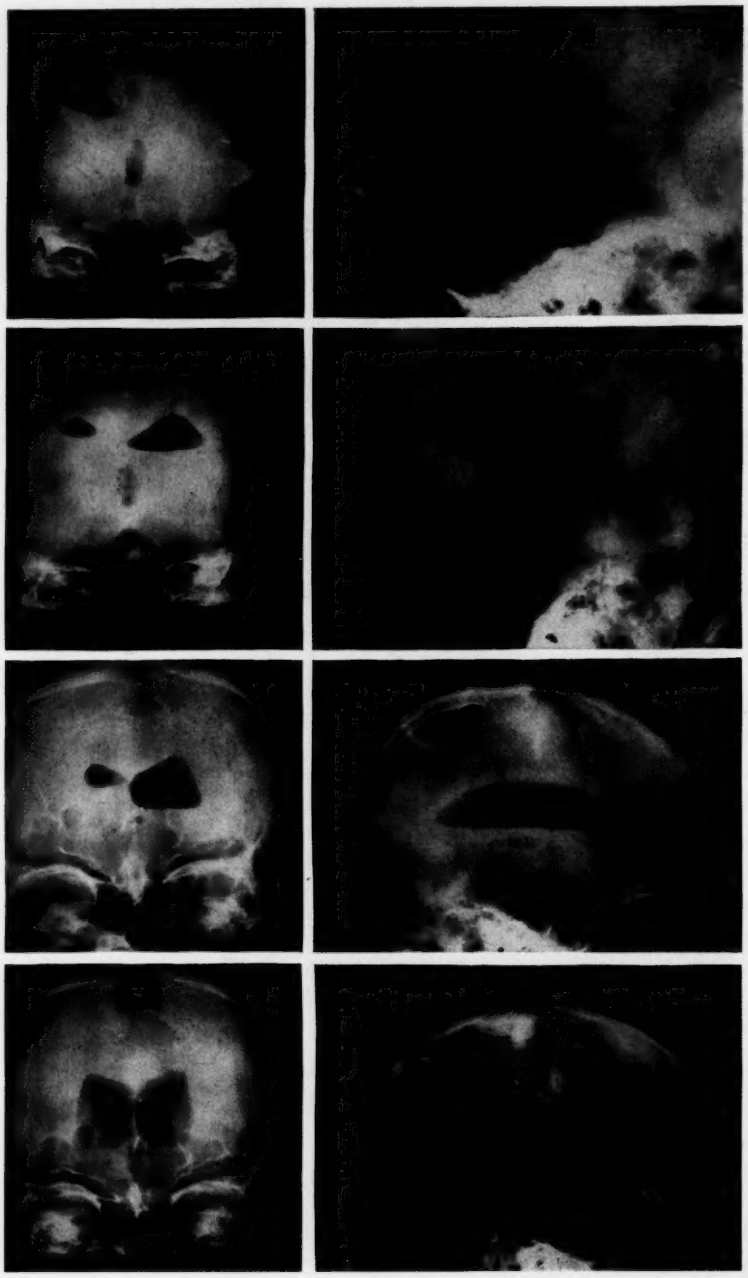


Fig. 4.—*A* and *B*, anteroposterior and lateral views. Head in 20 degrees of flexion after introduction of 7 cc. of air. Film shows air in the fourth aqueduct and third ventricle. *C* and *D*, anteroposterior and lateral views. Head in slight extension, showing lateral and third ventricles after introduction of 14 to 20 cc. of air.

Data on Twenty-Three Cases

Patient No.	*Age*	*Diagnosis*	*Papilledema*	*Air Used, cc.*	*Result*
1	30	Hypofisis adenome	0	24	G
2	13	Tuberculoma	5D	24	F
3	43	Tuberculoma	4D	24	G
4	33	Cysticercosis	6D	24	G
5	17	Craniopharyngioma	0	24	G
6	63	Sarcoma	Atrophy Sec.	24	G
7	35	Glioblastoma	9D	24	G
8	40	Cysticercosis	2D	24	G
9	22	Cysticercosis	2D	24	G
10	47	Glioblastoma	3D	26	G
11	38	Cysticercosis	6D	24	F
12	32	Cysticercosis	Atrophy Sec.	24	F
13	48	Glioblastoma	6D	24	F
14	25	Glioblastoma	3D	30	G
15	50	Glioblastoma	0	24	G
16	33	Glioblastoma	6D	24	G
17	11	Pinealocitoma	9D	24	G
18	22	Tuberculoma	Atrophy Sec.	24	B
19	23	Chromophil Cust.	Atrophy Sec.	24	G
20	22	Cysticercosis	4D	24	G
21	33	Pituitary aden. chrom.	0	24	F
22	25	Glioblastoma	0	24	G
23	35	Subdural hematoma	0	24	G

ualized in 92 per cent of cases, the cisterna chiasmatis in 78 per cent and the cisterna pontis in 65 per cent. All others fill in a small proportion of cases.

Technic.—The patient is prepared by the hibernation technic of Huguenard and Laborit or with barbiturates and local anesthesia.

We use the Lyshold apparatus (Fig. 3*A*), and the patient is seated, with the surgeon behind him. The films are taken during the injection of air. The lumbar puncture is performed with the head flexed at a 20 degree angle (Fig. 3*B*) and the air is slowly injected, after withdrawal of 5 to 8 cc. of cerebrospinal fluid. The first injection usually consists of 5 to 7 cc. of air, but we may use 10 to 15 cc., depending on the case. If there is a high degree of papilledema, it is advisable to use 5 cc. at a time.

The roentgenograms are taken in a series, the first being the posteroanterior and lateral. By shifting the roentgen tube and maintaining the patient's head in the same position, additional views are taken. By this method it is possible to see the cisterna magna, the fourth ventricle, the aqueduct and the posterior portion of the third ventricle. One can visualize other portions of the ventricular system by shifting the position of the head to neutral, hyperflexion, or hyperextension, depending on the diagnosis.

After this, 5 to 7 cc. of spinal fluid is removed before the injection of additional air, and the head is raised to a 30-degree angle, so that air flows into the basilar cisterna (Fig. 3*B*). In the third step, if visualization of the sulci over the cerebral convexity is desired, we inject 5 to 7 cc. of air with the head markedly flexed forward (Fig. 3*C*) at a 30-degree angle, so that air passes by the dorsal cerebellum

Fig. 5.—Several views showing moderate hydrocephalus and displacement of the ventricular system by a glioblastoma in the parieto-occipital region.

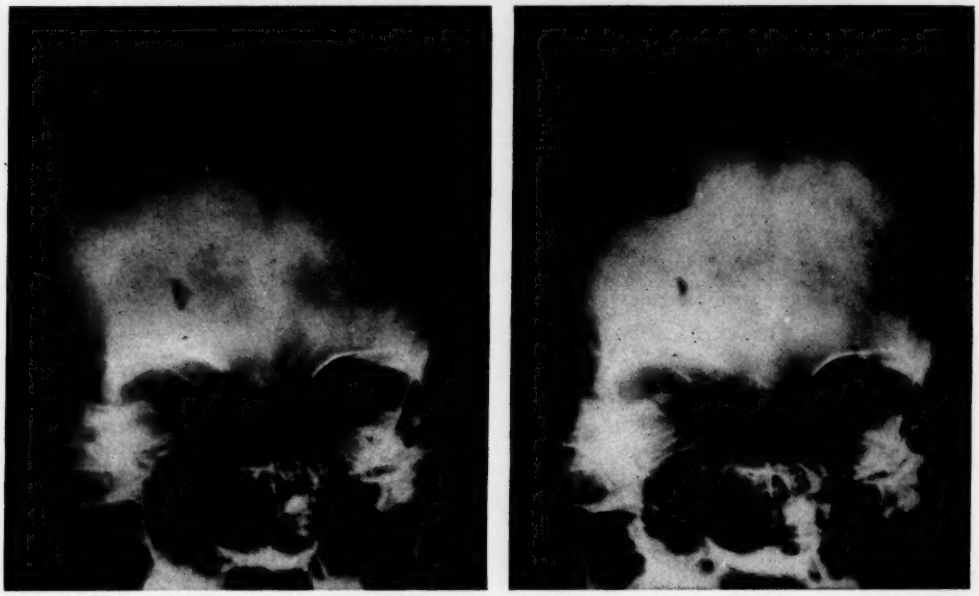


Fig. 6.—Films showing displacement of the lateral system by a large glioblastoma in the right parieto-occipital region.

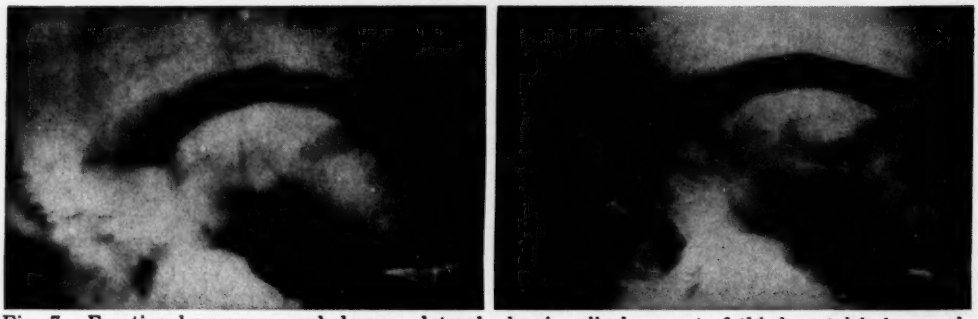


Fig. 7.—Fractional pneumoencephalogram, lateral, showing displacement of third ventricle by an abscess in the sellar region.

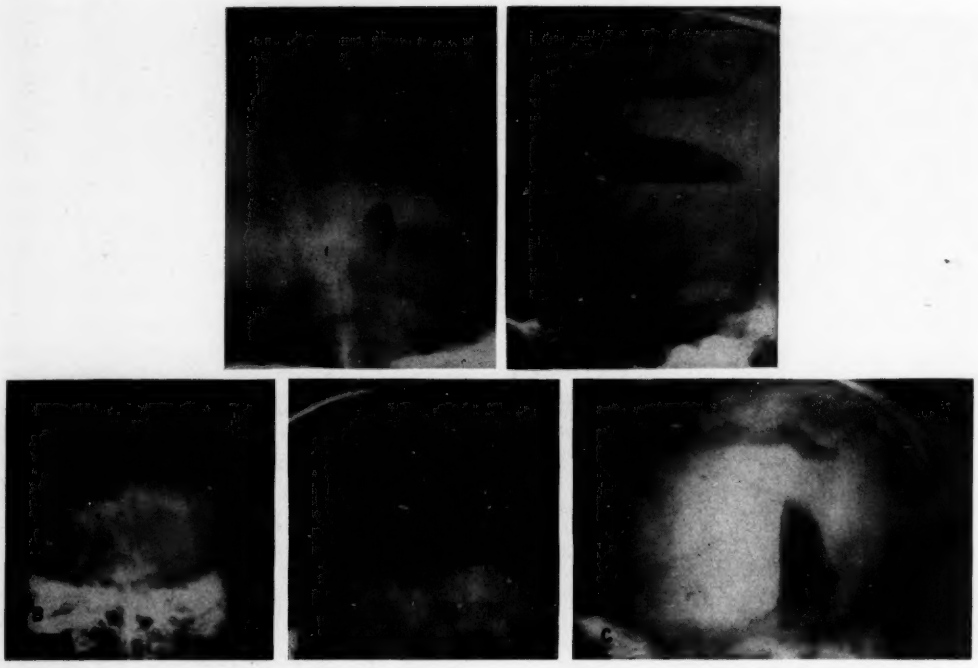


Fig. 8.—*A*, posteroanterior and lateral views. Head is in 20 degrees of flexion, showing air in the third and fourth ventricles and the lateral ventricle. The third ventricle is displaced from the left to the right side. The left side of the lateral cavity is higher than the right side, and the right side is dilated. *B*, posteroanterior and lateral views at 40-degree angle, showing the lateral ventricle displaced by a large cystic tumor (pineocytoma). *C*, lateral view, showing displacement of the occipital horns after introduction of 24 cc. of air.

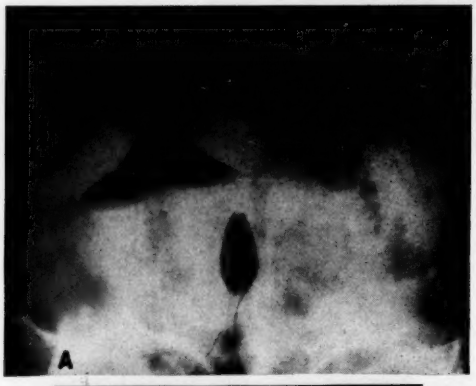
and cerebral hemispheres. The Rous position (Fig. 3*D*) permits visualization of the anterior portion of the ventricles and also the cisterna chiasmatis and the cisterna laminaris. The total amount of air employed is 24 to 30 cc.

Finally, we make the films in the anteroposterior and lateral positions with the patient supine, in order to see the frontal horns and the entire ventricular system.

Statistics.—Of a total of 1,600 pneumoencephalograms, we have employed only 39 fractional pneumoencephalograms. The diseases in which they were used are tabulated below.

Sellar abscess	1
Cranipharyngioma	1
Chromophobe adenoma	2
Glioblastoma	7
Chromophile adenoma	1
Pinealocitoma	1
Chiasmal arachnoiditis	6
Tuberculosis	4
Cisticercosis	6
Tuberculoma	3
Subdural hematoma	1
Neurologic disease	5
Sarcoma	1
Total	39

Of this series only 23 patients have been communicated with at the time of writing, and they are subdivided into the following groups:



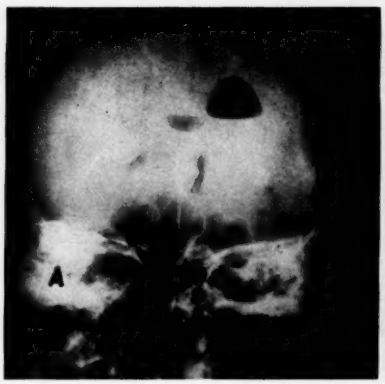
1. Supratentorial tumors:
   - Sarcoma 1
   - Glioblastoma 5
   - Adenomas 2
   - Tumor sellar 1
   - Craniopharyngioma 1
   - Tuberculoma 2
   - Pinealocitoma 1
2. Infratentorial tumors:
   - Glioblastoma 2
   - Tuberculoma 1
3. Parasitic infestation:
   - Cysticercosis 6
4. Traumatic complications:
   - Subdural hematoma 1

Reactions to the Fractional Pneumoencephalographic Procedure.—In our experience (1,600 pneumoencephalograms), the first symptom to appear after a pneumoencephalographic study was headache. Other symptoms, more or less in the order of their appearance, were slowing of the pulse, a fall in the blood pressure, nausea, vomiting and, at the same time, syncope.

According to Dyke, 30 to 60 cc. of air produced symptoms for an average period of one and nine-tenths days, and patients given 60 to 90 cc. showed symptoms for an

Fig. 9.—*A* (*upper left*), view posteroanterior with head slightly flexed (20 degrees), showing dislocation of the third and lateral ventricles by a tuberculoma in the cerebellum (7 cc. of air). *B*, (*lower left*), lateral view with head in neutral position (same patient), showing depression of the roof of the lateral ventricle by a tuberculoma in the parietal region (14 cc. of air).

Fig. 10 (*below*).— *A* and *B*, posteroanterior and lateral views in a case of subdural hemotoma, showing typical ventriculographis changes in the right side, with depression of the roof.



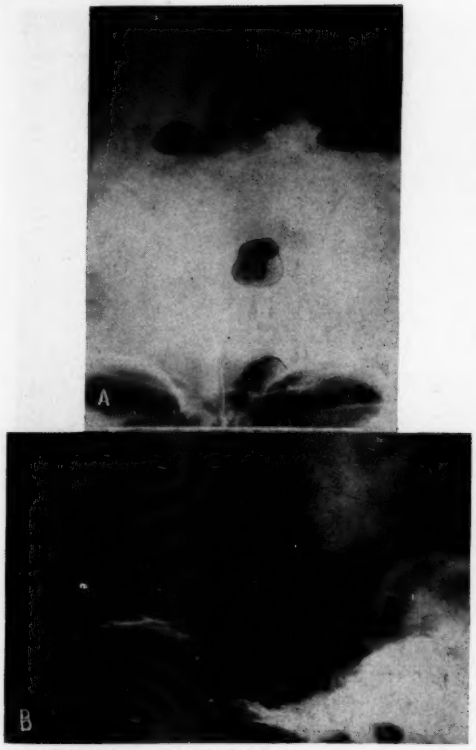


Fig. 11. — *A*, posteroanterior view, showing hydrocephalus and obliteration of the cisterna magna on the right. *B*, film taken with head in the Rous position, showing hydrocephalus and the absence of air in the cisterna sellaris.

average period of two and one-half days. With the fractional or controlled pneumoencephalogram these reactions were absent. Contraindications to pneumoencephalographic study have been stressed so much that Dandy, in 1919, stated in his first paper on pneumoencephalography: "A spinal puncture should never be made if a tumor is present." Martin and Uhler (1922) considered tumor in the posterior fossa the only contraindication to pneumoencephalographic study. Denk (1923), Ginel (1928), Friedman, Snow, Pancoast, Fay and Pendergrass were in accord with the contraindications of its use in the presence of tumors of the posterior fossa. Gardner and Nosik (1942) reported 24 cases of tumor of the posterior fossa in which pneumoencephalograms were taken; the procedure was done without knowledge of the location of the tumor.

Our experience is small but sufficiently promising so that we have employed fractional pneumoencephalographic studies, using 30 cc. of air, in the presence of intracranial hypertension. Among the lesions were gliomas, cistercosis and tuberculoma, with papilledema ranging from 1 to 9 diopters. To demonstrate this we present illustrations from some of the 23 cases.

COMMENT

The experience that we have obtained with the fractional pneumoencephalographic study suggests to us that it is a procedure superior to Dandy's method and may be superior to the lipiodol method, because the contrast medium is an irritant.

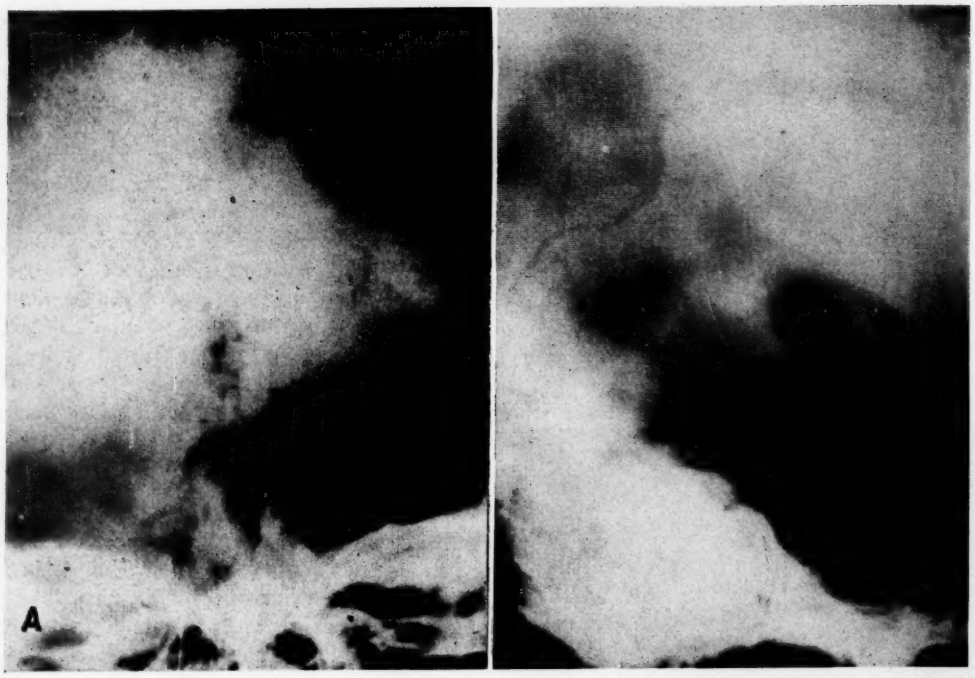
The fractional pneumoencephalographic technic permits us to study serially the kinetics of the cerebrospinal fluid and obtain serial views of the ventricles, the subarachnoid spaces and the basal cisterna.

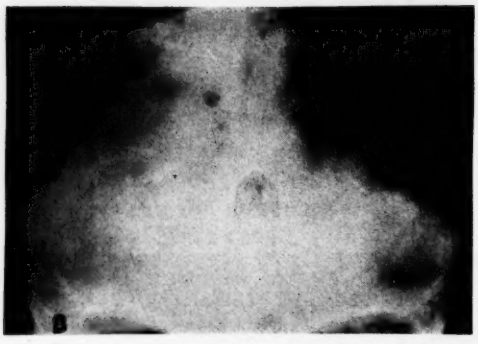
The advantages of this technic are:

1. Anatomic visualization of the brain, with elimination of the symptoms caused by Dandy's method.
2. Feasibility in the presence of increased intracranial pressure.
3. Absence of the disturbing effects of large quantities of air.

SUMMARY

The authors have employed fractional pneumoencephalographic studies in 39 cases. Twenty-three of the patients had brain tumors associated with papilledema (1 to 9 diopters). Among the 23 patients with brain tumor, 13 showed evidence of





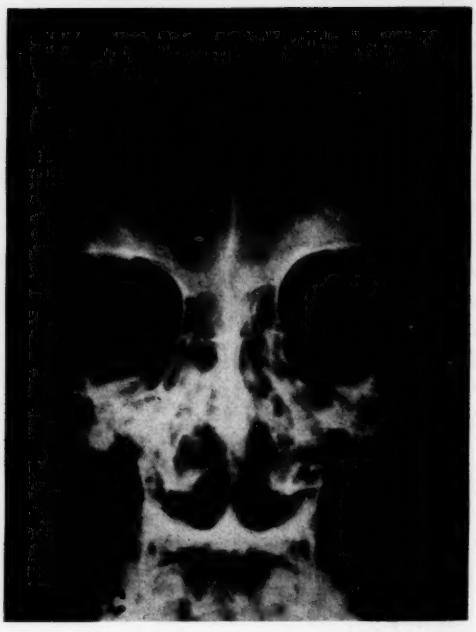


Fig. 12. — *A*, posteroanterior and lateral views showing a defect in the cisterna magna and the fourth ventricle, due to cysticercus. *B*, film taken from the posteroanterior position showing dilatation of the third ventricle. *C*, anteroposterior view of skull showing hydrocephalus.

increased intracranial pressure with papilledema and 4 showed evidence of secondary optic atrophy.

RESUMEN

Los autores han utilizado el estudio pneumoencefalográfico en 39 casos. Veinte y trés de los pacientes padecían tumores encefálicos asociados a papiledema (de 1 a 9 dioptrías).

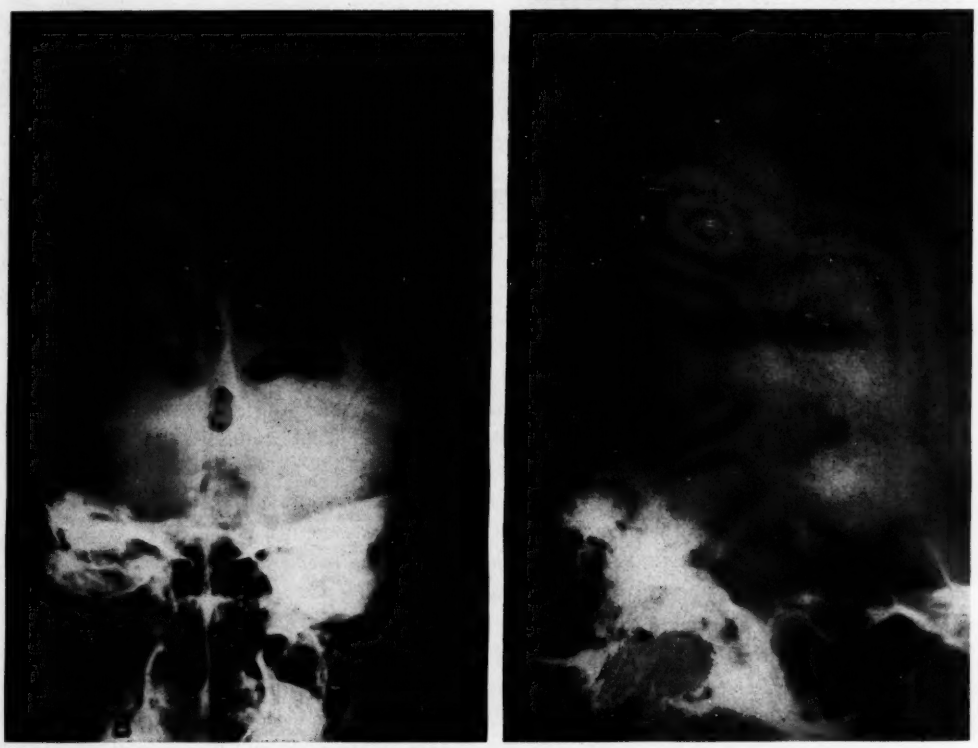


Fig. 13. *A* (case of A. C.). — Fractional pneumoencephalograms in a case of craniopharyngeal tumor, showing the characteristic deformity and displacement caused by a tumor in the sellar region. *B* (case of P. A.).—Films showing upward displacement of the third ventricle.

Trece enfermos de los veinte y trés mencionados mostraron evidencia de aumento de presión intracraneal con papiledema, mostrando cuatro de ellos evidencia de una atrofia óptica secundaria.

ZUSAMMENFASSUNG

Die Verfasser haben die fraktionierte Pneumoenzephalographie in 39 Fällen angewandt. 33 Kranke hatten einen mit

Papillenoedem einhergehenden Hirntumor (1 bis 9 Dioptrien).

13 dieser Hirntumoren waren mit erhöhtem Hirndruck und Oedem der Papillen verbunden und vier zeigten Anzeichen einer sekundären Sehnervenatrophie.

RÉSUMÉ

Les auteurs ont appliqué la Pneumoencephalographie fractionelle a 39 malades, dont 23 souffraient de tumeurs cérébraux accompagnés d'oedème pappillaire (1 a 9 diopters). Parmi les 23 malades avec tumeur cérébral il y avait 13, dont la pression intracranielle était élevée et de l'oedème pappillaire était present, et 4 montraient l'évidence d'atrophie secondaire du nerf optique.

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Evil and good are phases in the process of growth; and who shall say which is the better teacher? Illness, error, defeat, frustration, disintegration, malicious accident, all these elements are as much in the process of life as waste, nutrition, and repair. The very forces which, if triumphant, would destroy life are needful to season experience and deepen understanding. Like arsenic, evil is a tonic in grains and a poison in ounces. The real problem of evil, the problem that justifies every assault upon war and poverty and disease, is to reduce it to amounts that can be spiritually assimilated.

This doctrine is just the opposite of certain "optimistic" life-denying attitudes and habits of mind that have become popular during the last three centuries: particularly, the notion that comfort, safety, the absence of physical disease, are the greatest blessings of civilization, and that as they increase evil will be automatically abolished.

—Mumford

Section on Ophthalmology and Otorhinolaryngology

PAUL C. CRAIG, M.D., F.A.C.S., F.I.C.S., EDITOR

Recent Trends in Otology: Surgical Fenestration

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CHICAGO, ILLINOIS

THE reorientation of otologic surgery from the evacuation of pus toward reconstructive operations to improve hearing constitutes one of the strangest trends of recent otology. Thus Cawthorne observed that in the King's College Hospital in London, 98 per cent of operations on the temporal bone were for the relief of suppuration in the year 1934, while just fifteen years later only 25 per cent were for suppurative disease and 75 per cent were performed in a clean field for non-suppurative conditions. Fenestration has become the most frequently performed operation on the temporal bone, and in this hospital, as well as in certain others, the total number of operations on the ear today actually exceeds the total number performed in the presulfonamide era for suppurative disease.

When one considers trends in the fenestration operation itself, there are three in particular that can be traced all the way back to the early beginnings of the surgical treatment of otosclerosis. The first of these is the trend toward an ever more careful and meticulous aseptic technic. The early attempts to improve the hearing in otosclerotic patients by extracting the stapes or making a fistula into the labyrinth ended in fatal infection so often that leading otologists at the beginning of this century were unanimous in condemning this procedure. The first great step forward was taken by Holmgren, who demonstrated in many operations, beginning in 1917, that the labyrinth could be opened safely in a clean field under careful aseptic technic. However, when Sourdille, in 1924, made the next important contribution and devised the principle of a fistula in the horizontal canal, covered with a pliable skin flap that sealed off the tympanic cavity, infection in the postoperative wound was still such a problem that the operation needed to be done in stages, with time for suppuration to cease before the next stage was undertaken. It remained for Dr. Julius Lempert to prove in 1938 that healing will occur without suppuration provided sterile technic is employed with the postoperative dressings as well as in the operating room, and that the operation can be done safely and advantageously in one stage. Last year, in the Wherry Memorial Lecture, I cited the experimental evidence that even the very mildest infection of the cavity can diminish the chances of a good result, first by increasing the possibility of cochlear damage from serous labyrinthitis and, second, by leading to fibrosis and osseous closure

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of the fenestra.

In scientific discussions we prefer to avoid dogmatic statements. Nevertheless, on this question of aseptic technic it is my opinion that one can and should be quite dogmatic and definite in teaching that the most meticulous, precise and completely sterile precautions during the entire operation and in postoperative care, until epidermization is complete, is requisite to the best results from fenestration. Chemotherapy and antibiotic therapy are valuable adjuncts but cannot substitute for good aseptic technic. The occurrence of granulation or suppuration in the postoperative cavity before it is dry and epidermized must be considered as evidence of a slip in technic, with the introduction of infection—by the patient, perhaps, but more probably by the surgeon. One definite trend in fenestration has been and continues to be the constant improvement of a meticulous sterile technic in the operating room and in the handling of all postoperative dressings.

The second trend in fenestration has been toward better selection of cases for operation. Here, again, Lempert pioneered when he laid down the fundamental requirements of an adequate cochlear reserve in the presence of a conductive hearing loss with intact tympanic membrane. Lempert's admonition to determine the cochlear reserve both by audiometric bone conduction and by tuning fork tests with masking of the opposite ear continues to be the main basis for selection.

In the past few years the calibrated speech reception and discrimination tests have been applied to the selection of cases for fenestration. A discrepancy between the pure tone and speech tests suggests a psychogenic overlay which should be investigated before the patient is operated on. A low score in the speech discrimination test indicates cochlear involvement.

These tests have also been helpful in comparing the hearing after fenestration with the hearing from a hearing aid. We have found that in cases of *B* and *C* suitability, with beginning cochlear degeneration, a well-fitted hearing aid will give the patient better hearing, on the average, than will a successful fenestration. On the other hand, in cases of *A* (ideal) suitability without cochlear loss for the speech frequencies, a fenestration on the average will give the patient hearing that is superior to a hearing aid. Accordingly, patients of *A* suitability are advised to choose fenestration, while patients of *B* and *C* suitability are urged to use a hearing aid, provided they can tolerate this prosthesis.

In 1950 Davis and Walsh made a further contribution toward the selection of cases for operation when they defined the limits of improvement after successful fenestration as a residue of at least 20 decibels of unrestored conductive loss, due presumably to loss of the impedance-matching effect of a large tympanic membrane connected to a small oval window by the intact ossicular chain. Subsequently, Carhart and I suggested 25 decibels as the average value for this residual conductive loss. We discovered that the results of fenestration in a particular patient could be predicted fairly accurately by simply plotting a curve 25 decibels below the bone conduction audiogram after correcting for Carhart's otosclerotic notch. More recently Davis and Walsh demonstrated that the residue of unrestored conductive loss after successful fenestration could be reduced 5 to 10 decibels in about 50 per cent of successful fenestrations by blocking the tympanic membrane, thus increasing the sound pressure differential between the fenestra and the round window.

As a result of the improved methods of selecting patients for operation, a higher percentage of *A* patients are being operated on today than fourteen years ago.

Of the 229 fenestrations performed by myself and my associates last year, two-thirds (68 per cent) were on *A* patients, 26 per cent on *B* patients and 6 per cent on *C* patients, whereas of 234 patients operated on ten to fourteen years ago, this sequence was 50, 23 and 27 per cent respectively. Patients with partial stapes ankylosis are not operated on until the stapes has become sufficiently fixed to insure that a useful hearing improvement will result. The trend toward more effective selection of patients for fenestration is partly responsible for the improved results in recent years.

The third trend in fenestration — and the most important in its influence on the results — is the trend toward more lasting hearing improvement. The early operations of Barany and Holmgren, to create a sound pathway into the labyrinth, invariably failed, owing to osseous closure of the fistula. Although Sourdille did succeed in obtaining some lasting improvements in the hearing of some of his patients, 2 of whom I had the opportunity to examine in 1947, 1 operated on in 1932 and the other in 1935, osteogenesis continued to be the chief cause of failure. Lempert, with his one-stage endaural fenestration technic, was the first to achieve audiometrically proved lasting improvements in hearing, but osseous closure continued to be a major problem. It was not until experimental studies on the monkey, begun by Engstrom and Holmgren and continued by Fowler Jr., myself, Lindsay, and Lempert and his associates, began to bring to light the six factors that influence osteogenesis at the fenestra, that technics were evolved with which closure of the fenestra rarely occurs. These technics emphasize meticulous removal of every microscopic particle of bone dust; wide exposure of the osteogenically less active endochrondral layer of the capsule; preservation of the endosteum to the sharp edges of the fenestra, where it will unite with the periosteum of the flap to produce healing of the bone by first intention; doming of the fenestra and use of special packing to insure contact between the skin flap and the endosteum; creation of a smooth polished bone surface, and, finally, the elimination of bleeding or infection. The third trend in fenestration has been toward a more precise and exacting surgical technic which, when properly executed, has largely eliminated failures due to closure.

Before leaving the consideration of the permanence of hearing improvement after fenestration, a review of the hearing results in cases followed for ten to fourteen years after the operation will be of interest. For this study 234 surgically treated ears were available, with tests made ten or more years after the operation. All of these operations were performed by me, utilizing my continuous irrigation and (except in the first 17 cases) the operating microscope modification of Lempert's technic. In all, 544 operations were performed during this period, but in more than half there is no audiogram taken ten years after the operation; these are therefore omitted from the study.

Of the 234 ears reviewed, exactly half classified as *A* and half as *B* and *C*. Considering the *A* patients alone and the status of the hearing one year after the operation as contrasted with that existing ten to fourteen years after the operation, one sees that in one year 68 per cent were at the practical serviceable level, 20 per cent showed an improvement of more than 10 decibels for the speech frequencies but not to the practical level, while 12 per cent were not improved or were worse, most of these being closures. In the most recent test only 47 per cent were at the practical level; 35 per cent were improved, but not to this level, and 18 per cent were not improved or were worse, half of these being closures. Examining each case individ-

ually to determine the reason for the downward trend in hearing, one finds that in 27 per cent of the *A* cases some degree of cochlear nerve degeneration developed during the ten to fourteen years after the operation. A number of these patients, who were in their late fifties or early sixties at the time of operation, are now in their late sixties or seventies and have undoubtedly experienced the normal cochlear deterioration of age. In others the otosclerotic process has probably begun to involve the labyrinth. In some there is definite evidence that labyrinthine hydrops is the reason for the cochlear loss. In a previous study Adin and I observed that in more than 10 per cent of fenestrated patients the symptoms of hydrops eventually develops, with intermittent and fluctuating fullness, roaring, dizziness, distortion and a drop in hearing.

Of the *B* and *C* patients, only one had hearing at the practical level after ten to fourteen years, which is not surprising, since one does not promise such patients full rehabilitation. Cochlear degeneration caused a deterioration in hearing in 43 per cent of the *B* and *C* patients after ten to fourteen years, as compared to 27 per cent of the *A* patients. Since one might expect persons who already show beginning cochlear involvement at the time of operation to continue to experience cochlear degeneration, it is actually surprising that 57 per cent of the *B* and *C* patients did not show any increase in cochlear loss in the years after surgical intervention. Evidently the otosclerotic process can lead to a large degree of cochlear loss and can then become inactive for a long time and possibly prove to be burned out.

This study of hearing results ten to fourteen years after operation reveals a gradual tendency toward cochlear deterioration in about a fourth of the *A* patients and in nearly half of the *B* and *C* patients. When one considers the normal aging of these patients, it is actually a little surprising that roughly half of the *A* patients maintain stable hearing at the practical, serviceable level for such a long period.

ZUSAMMENFASSUNG

In der Fensterungsoperation strebt man nach einer immer sorgfältigeren aseptischen Technik, nach besserer Auswahl der Fälle und nach der Erzielung dauerhafterer Resultate mit Hilfe einer zunehmend exakten und genauen Technik, die keine die Verknöcherung des Fensters stimulierenden Einflüsse aufzutreten gestattet.

RIASSUNTO

L'atteggiamento moderno nei confronti della chirurgia di fenestrazione è orientato verso tecniche sempre più asettiche, verso una migliore selezione dei casi e verso il raggiungimento di risultati più durevoli per mezzo dell'impiego di tecniche più esatte che evitino qualunque stimolo Osteogenetico a livello della finestra.

RÉSUMÉ

Les efforts qu'on fait dans l'opération de la fenestration concernent une technique de mieux en mieux en asepsis, un meilleur choix des cas et l'effort d'atteindre un succes qui dure plus longtemps, en suivant une technique de plus en plus précise, pour éviter touts les incidents qui stimulent l'ostéogenesis à la fenetre.

RESUMEN

La tendencia que ha sumido la cirurgía de la fenestración ha sido hacia aumentar los cuidados de una técnica aséptica, mejorar la selección de los casos y hacia lograr resultados más duraderos, por medio de una técnica más exacta que no produzca ninguna de las influencias que estimulan la osteogénesis de la ventana.

Editorial

Surgery and Color Television

IT was recently my pleasure — and a deeply moving experience for an engineer — to be invited to address the Twentieth Annual Congress of the United States and Canadian Sections of the International College of Surgeons. It was doubly a pleasure to speak on a topic concerned with electronic engineering, and to describe the newly significant role of color television in the field of surgery.

Television—a modern marvel—in effect annihilates time and space. It brings together in an instant the most widely separated places.

Television is also an extremely versatile medium. Its pictures may be in black and white or in color. They may be two-dimensional, as at present; and, after lengthy and difficult researches have been completed, they may become three-dimensional, thus giving the impression of full solidity and definite spatial separation of objects within the field of view.

Television programs may originate in as many locations as desired — for example, in hospitals, laboratories, wards or clinics.

Television reception may occur in a practically unlimited number of places. Receiving points may also be in hospitals, lecture rooms, libraries, laboratories and offices; at data-assembling or analyzing points, or in the home of the physician.

While present-day television broadcasting operates in one direction from the transmitting station to the great national audience of tens of millions of viewers, television can be arranged to operate in two directions. This enables those at each of two or more locations to see and hear each other. The method requires the setting up of special interconnecting arrangements. Although it is useful to surgical groups, its general use by most others is still remote.

Obviously, any medium that permits round-table discussions, with sight and sound contacts, among as many groups as desired in whatever locations they may be, is a highly important educational agent. It may well lead to a basically expanded type of educational institution. An amazing University of the World will have its lecture rooms and speakers' platforms all over the earth. It will tie together scientists, teachers, demonstrators and students into one vast and integrated audience. This is indeed "something new under the sun," which will be a potent force for the welfare and health of humanity.

It should be emphasized that the close and private relation between the physician and his patients, as well as the nature of much medicosurgical material, precludes the use of ordinary television broadcasting for these purposes. The requirement of privacy is met by the use of closed circuits, which prevent unauthorized persons from intercepting and viewing surgical proceedings or hearing surgical data. Also usable on an equivalent closed basis are specially engineered microwave directional radio circuits, which are employed, for example, on many transcontinental, inter-

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city, or other network links.

Television symposiums or conventions provide new means of tying together, by interconnection, widely separated hospitals and thus combining them into the superclinic of the future. The most expert knowledge of each will be available to all. In so complex and rapidly advancing a profession as medicine, this collaboration must become helpful to all.

As has been mentioned, cable or radio-relay circuits already carry television thousands of miles and could be engineered to carry television sessions (or "telesessions") over any terrestrial distance. Even the Straits of Magellan at the southern tip of South America could be televisually connected with Cape Town at the southern tip of Africa by either of two (or more) routes. One route would carry the "telesessions" up the west coasts of South and North America to Alaska, across the Bering Straits, across Russia or China to Asia Minor, thence to Africa and down to Cape Town. (This route naturally awaits placid world conditions.) Another route would pass up the west coasts of South America and Central America to the United States, thence across the United States, and up the East Coast of North America, followed by a series of inter-island jumps to Scotland and England, across the Channel to France, over Europe to the Near East, and thence through Africa to Cape Town. (Obviously, intercontinental television fosters the study of geography!)

Passing to the received television picture, this is presently produced on the available 21-inch color kinescope tube and has an area of 260 square inches (which is ample for a small group of professional observers, say 20 persons). For larger audiences, theater types of color television projection are available, presenting pictures up to 15 by 20 feet. The received picture may show a close-up of one person, or it may show a medium shot including a few people or a long shot showing a large area and numerous persons. It can present anything from a microscope slide to a large vista. In general, anything that can be seen by the human eye can be shown by television, and sometimes shown far better than it can be seen by the eye!

Electronic technics may be applied to improving or changing the characteristics of the picture in various extraordinary fashions. Today it is possible to brighten pictures tenfold; tomorrow, perhaps a hundredfold. This could lead to rapid examination of brightness-amplified fluoroscopic roentgen images in normally illuminated rooms. Since the roentgen dose might thus be reduced, more frequent mass roentgen examinations might become feasible, with highly beneficial results in the early detection and diagnosis of obscure lesions.

It is also possible to sharpen pictures electronically, thus producing better defined boundaries in roentgen images. Indeed, one can even change an ordinary halftone picture into a line drawing purely by electronic means. These technics might be applied in such widely diverse fields as the preparation of drawings for surgical textbooks or records and the automatic rendition of animated drawings or cartoons based on the action of live characters or on photographs of actual objects.

The received and transient monochrome or color television picture can also be permanently recorded, by various methods, for duplication or repeated use. Black and white or color film may be used. Without going into details, the color-recording methods involve area-sharing on black and white film, recording on lenticulated black and white film, or photographing on color-negative or reversible color-positive film. Practical equipment of these types will probably become available for surgical purposes in due course. It will make pos-

sible the creation of a comprehensive visual library of high accuracy, covering major problems, methods and specialized surgical technics. Such records, available for educational and professional use, may well become a new type of surgical encyclopedia.

It is also possible to record color television subject matter on magnetic tape traveling some 15 or 20 feet per second. This new and ingenious art is in its earlier stages and is undergoing intensive development.

Another related possibility of film recording is the recording and reuse of fixed subjects, such as textual or book material, by technics based on television. This system (the Ultrafax system) was used, for example, in Washington, when the ponderous tome *Gone With The Wind* was television-transmitted and film-recorded in its entirety in less than three minutes! The Government has used such methods successfully, and they may well have major value in the interconnection of medical and surgical libraries, all of which may eventually be in close contact with a central repository. Thus, information that could not be economically stored in book or paper form in all the regional libraries may nevertheless be rapidly transmitted to any one of them on request. Clearly, television will add to the "University of the World" its necessary adjunct, the "Library of the World." Thus, electronics will one day make available, to any surgeon or physician anywhere, at least as much information as he may desire and can assimilate from any central or regional source anywhere on this planet!

A color picture of any sort — e. g., a stained microscopic slide — can readily be television-transmitted from one location to another, where it is instantly recorded. There are also conceivable methods for the automatic or semiautomatic classification and filing of these slides and for their speedy and accurate electronic comparison with others already on file in the central repository. Vast and significant changes in diagnostic and other medical and surgical procedures can thus be foreseen. The scope activity of the individual physician can be widely extended. His resources will be multiplied. His cooperation with his fellows will be made easier and more frequent. Obviously, any service that greatly expands the senses of man and effectively "places" anybody anywhere at any time will profoundly and beneficially affect existing procedures.

Discussion of the medical applications of color television must be restricted to an outline. Indeed, only extensive and prolonged use of this medium will fully disclose and develop its manifold potentialities.

In the educational field, it will greatly facilitate and broaden the training of students, the postgraduate instruction of interns, and the convenient offering of refresher courses to surgeons. Each of the recipients may be in any desired location and in a greatly advantageous viewing position, approximating that of the surgical or medical demonstrator; and the viewers, of course, will have no effect on the space required or the aseptic conditions at the pickup point.

Diagnosis and prognosis can be carried out in consultations by color television with surgeons at nearby or remote points. Surgical procedures can be closely watched and comments from colleagues invited.

In clinics, especially interesting or significant cases may be brought, immediately or later, to the attention of a large group of trained onlookers.

Hospital wards may be supervised by television from a central point; for example, from the superintendent's office or from a medical observation room. Psychiatric wards may be viewed, with occult

observation of individual patients.

Biopsies and autopsies can be demonstrated either to students or to graduate surgeons, or they can be recorded for instructional or forensic purposes. Models, charts and other visual aids can be shown by color television on any desired scale, as can microscope slides of tissue sections or other pertinent material.

At central data-processing points great numbers of slides can be studied and classified, and the negative-indication and positive-indication slides can be automatically separated and preserved, after recording for further study or reference.

Any material of interest can alternatively be recorded at or near the pickup point by one of several different methods, on 35 mm., 16 mm. or 8 mm. film, or alternatively on 2-by-2 or 3½-by-4 inch slides.

There is almost unlimited flexibility in the use of electronic color television and in the recording of color television material and its later classification and reuse.

In a comprehensive compilation prepared for the American Medical Association, some of those fields are described. They include subject matter that can be effectively handled by television. In abridged outline, these fields include: allergy, anesthesia, cardiovascular, dermatologic, endocrinologic, gastrointestinal, laryngologic and malignant diseases. It will be useful in miscellaneous procedures, including rehabilitation of the deaf and of persons with speech defects; in artificial respiration; and in the handling of neurologic, obstetric, orthopedic, pathologic, pediatric, psychiatric, pulmonary diseases, as well as conditions due to radioactivity.

It should be stressed, particularly in the case of surgical subjects, that the addition of color to the reproduced pictures not only offers major advantages but is often an absolute necessity.

In view of the justified interest of surgeons in color television, it is appropriate to present here a brief general description of its principles and practices.

Color television is the science and art of electronically carrying color images originated at one (or many) locations to one (or many) destinations, where such images are reproduced with high pictorial fidelity. In general, the accompanying speech or sound is also carried from the pickup point to the receiving point. Color television is therefore understood to include the adjunct sound.

In merest outline, color television depends on analyzing a colored image into its three component or primary-color images. These are respectively a clear red, an emerald green and a deep blue. It has been observed that practically all colors can be reproduced by the addition, in suitable proportions, of lights of these three primary colors.

Accordingly, the color television camera or pickup device at present usually includes three camera tubes which, with appropriate color filtering, respond individually to one of the primary colors. The camera tubes used in studio color cameras have been image orthicons, which are cylindrical tubes about 15 inches long and 3 inches in diameter. The usual image orthicon color camera, which will continue in broadcasting studio and outdoor use, is of such dimensions and weight as to be most readily handled by professional cameramen. More recently an important new camera tube, known as the vidicon, became available. Its volume is only a small percentage of that of the image orthicon. As a result, the most recent three-vidicon color cameras are quite small and light. They are thus particularly well adapted to use in the field of surgery in a convenient fashion. The surgical use of this three-vidicon color camera will be demonstrated for the first time before this

audience. The standard broadcasting type of three image-orthicon camera will also be used in the demonstration for supporting scenes, but not for the actual surgical procedure.

After the three primary color signals have been generated in the camera, they are suitably amplified and electrically represented in the picture or video signal, which is then transmitted in a fairly conventional fashion. Great precision in the transmission and reception of these signals is required, however, since undesired electric-wave time delays of the order of billionths of a second may prevent correct color reproduction. Fortunately, the related electronic problems have been skillfully solved.

Color television broadcasting to the public is open to all, and is carried by radio directly into the home. For obvious reasons, many medical and surgical subjects cannot be appropriately broadcast and therefore must be conveyed to their professional recipients by restricted or closed-circuit methods. Accordingly, surgical color television is carried over special cable, coaxial cable, or wire circuits inaccessible to the public (or, for long-distance transmission between cities, by microwave directional radio-relay circuits controlled by the Telephone Company and also inaccessible to the public).

The color pictures appear on receivers that outwardly closely resemble present-day monochrome receivers. The image may be viewed directly on a color kinescope or picture tube, or it may be projected by special optical means on screens of practically any desired dimensions.

In the placement of receivers, some care should be taken to avoid window reflections from the glass over the kinescope screen, and bright light should not fall on the picture area lest brightness contrast be lost, color be diluted and desaturated. The viewing room in the home, for example, should preferably have relatively limited illumination, and the preferred viewing distance is usually between 4 and 10 times the diagonal of the picture. Thus the image on a 21-inch color kinescope is preferably viewed at distances between 7 and 15 or 20 feet.

Reverting briefly to closed-circuit systems that bar public viewing, at present these must be of the wired, cable or Telephone Company-controlled microwave types. (If direct radio or on-the-air transmission to the recipients is ever authorized by the Government and used, the signals carrying a surgical program must be systematically coded or garbled so that they cannot be intelligibly received on ordinary receivers in the home. In that case, authorized professional viewers will require decoding equipment in their offices or in hospitals to restore the picture to clarity and intelligibility. The coding system would then have to be such as to give high security against unauthorized reception or pilferage of the program. But if closed-circuit or cable methods continue to be used to carry the signal to the recipients, coding and decoding of the signals will probably not be required, since communications over such cabled circuits are presumably protected by law against unauthorized tapping. To repeat a point on which some confusion has arisen, such cabled circuits are the only presently available means for carrying definitely professional surgical television transmissions, since licenses for the broadcast radio transmission of such material are unobtainable.)

It may be helpful to surgeons who plan to use color television to suggest a few of the preferred methods of presentation of surgical material to secure maximum effectiveness and clarity and to hold the attention of the audience. It must first be admitted that some surgeons will always be more effective on television than others,

but any surgeon can improve his television presentations by the following methods.

Intense lighting is needed for best rendition and is usually available. White areas should be avoided, and accordingly the surgeon's cap, gown and mask should preferably be light green or light blue. Close-ups are preferable to long shots through most of the presentation.

Training of the surgeon for television presentations is necessary, and careful preparation of the program and predictable action (when possible) are helpful. Whenever feasible, a rehearsal, at least in part, is desirable. This can be done without the use of a camera by a simulated presentation or so-called "dry run."

The program should be kept reasonably simple, with a limited number of topics. As much brevity as permissible is needed, and repetition should be avoided. The more sincere and relaxed the speaker, the more favorable the audience reaction. Comments should be kept direct and interesting throughout.

This paper would be incomplete and less helpful than is desirable without some comments on the preferred specifications and choice of a color television system. Such specifications are needed because the use of more than one system or the selection of an inappropriate system would be costly, time-consuming and wasteful of skilled personnel.

It is of course undesirable to burden surgeons with the complex and specialized problem of selecting a correct color television system. This is a lengthy and arduous task. For a period of years it occupied the close attention of the National Television System Committee (a group of scientists and engineers representing the television industry) and the Federal Communications Commission. On the basis of these studies, the two groups reached a definite and identical decision, namely, that the present compatible and simultaneous color broadcasting system should be approved and universally used.

Obviously, high picture quality is required by the surgeon. The corresponding and controlling factors are picture size, brightness, sharpness, color quality, ease of viewing, angular range of viewing, absence of fringing and avoidance of flicker.

Further, the color system should be economic and sparing of channel space or width of frequency band. The compatible simultaneous system is two or three times as effective in this regard as are other systems. Since the compatible system is universally used in color broadcasting over individual stations and national networks, receivers for this system will be widely found in homes and meeting places. Obviously, the surgeon will find most convenient a system so extensively used, and with the corresponding receivers already available on a nation-wide scale. Network operators and technicians are well acquainted with this system. Skilled men can be provided to operate and service it without further instruction or equipment. A universal and compatible system is therefore a great convenience and in some respects a necessity. It has the marked advantage of not requiring two different types of color receivers (nor adapters) in hospitals or doctors' offices (one for on-the-air color broadcasts, the other for closed-circuit and restricted programs). The on-the-air broadcasts are, as stated, on the standards of the compatible simultaneous system accepted by the National Television System Committee and approved and specified by the Federal Communications Commission. This compatible system also permits black and white as well as color to be interchangeably receivable. It has numerous other technical and operating advantages that fall outside the scope of this article.

One added important aspect of the present compatible system is that practically all major research, development and cost-

reducing work in the laboratories and factories is devoted to its improvement. Accordingly, the most highly developed equipment at the lowest overall cost will result from use of the compatible system.

And it may be particularly interesting to surgeons to know the highly significant fact that the nation's first assembly of compatible color television for hospitals is being provided to the three major medical projects of the United States Government, located at the Walter Reed Army Medical Center at Washington. These facilities will serve and interconnect in most effective fashion the Armed Forces Institute of Pathology, the Armed Medical Service Graduate School and the Walter Reed Army Hospital.

From time immemorial, surgeons and men of medicine have pursued their high calling of preventing illness, alleviating pain, applying curative measures and ministering to the health and welfare of humanity. This they have done in the face of stupendous difficulties arising from the morphologic, chemical and psychic complexities of the human organism, as well as the idiosyncratic reactions so often encountered. And, until recently, they have worked bravely through the ages with scant encouragement or assistance from those pursuing other professions and branches of science. Fortunately, this situation is changing. Organic chemists and biophysicists, among others, have made substantial contributions to the available *materia medica* and to knowledge of function and dysfunction in numerous physiologic domains.

Most recent to offer its contributions is the new profession of electronic engineering. This article, which covers only one facet of the electronic engineer's offerings to surgery and medicine, indicates both a desire and a hope for greater collaboration between men of our professions.

Those of us who are electronic workers are happy and gratified for every opportunity to participate with surgeons in an endeavor fraught with such value to humanity. We earnestly hope that our branch of science will enrich and expand the scope of yours, to the great benefit of our race. In that hope and expectation we shall go forward with you in fraternal concord and mutual helpfulness.

ALFRED N. GOLDSMITH, M.D.,
Sc.D. (Hon.), F.I.C.S. (Hon.)
New York City, New York

Mental emotions have a profound effect upon the small arteries and capillaries and thus influence blood-pressure. An elderly maiden lady had a pet cat who died, much to the owner's distress. Every time she talked of the dead cat, her blood-pressure rose. Another patient had a rise in blood-pressure whenever the service on the street railway was mentioned to her. It would be very interesting to take the blood-pressure of some plethoric middle-aged golf enthusiast after he places the ball on a tee, makes a vigorous swipe, and misses the ball altogether.

—*Major*

Herbert Acuff, M.D., F.A.C.S., F.I.C.S.
1886-1951

In 1951, in the November issue of the *Journal*, we paid what tribute we could, out of bitter grief, to one of the leaders of the College. Now, four years later, it seems only fitting that an issue dedicated to the Twentieth Anniversary of the founding of the International College of Surgeons should be dedicated also to a man whose humanity, kindness, understanding and natural wisdom did so much to strengthen and support the College. The unstinted devotion of Herbert Acuff to the College, and to the ideals that inspired its creation are nowhere better exemplified than in the letter we reproduce below.

June 21, 1948

My dear Dr. Thorek:

I have just returned to my home, and in reflecting upon the achievements of the past six weeks, I am constantly reminded how much of it all I owe to you.

The Honorary Fellowship in the Surgical Society of Rome is a recognition to be cherished by a limited number of surgeons in the world. Through your influence this came to "lowly" me. The honorary degree conferred upon me by the Piedmontese Surgical Society in Torino, the opportunity to present papers before both the Rome Assembly of the International College of Surgeons and at the Torino Meeting are all directly attributable to you.

Finally, you have placed upon my shoulders the mantle of leadership of the great International College of Surgeons, an honor which can only come to a maximum of fifty surgeons in a century—indeed, a small number out of the 50,000 surgeons of the half million physicians and surgeons of the world.

If I blessed the name of Max Thorek daily, which I shall do, for the remaining days of my life, I could not adequately express my gratitude for the honors you have made possible or my sincere personal admiration for you.

Yours has been an heritage given to but few men in the world. Endowed by God with capacity of intellect and emotion of soul, you have, by your own efforts, augmented both until in versatility of erudition you have few who compare, and your sense of appreciation for kindness and loyalty transcends the most extravagant interpretation of that term.

What can one do in re-payment for such an implied obligation? *To me your position as Founder of the International College of Surgeons is as a father whose pride in the growth and achievement of his child is sacred and boundless. I conceive my role in such a program to be both a duty and a pleasure, and to assist in the promotion and growth of this child until its scope and influence shall spread to the remotest confines of earth.*

To this end, I dedicate anew my strength, my ability and my constant effort to the growth and achievement of our College in the hope that this may, in a small measure at least, compensate for all you and the College have and shall do for me.

Again, with a gratitude which I believe you well know, I am

Gratefully and sincerely,

HERBERT ACUFF

New Books

Books Received.—The following books have been received by the Editor; they will be reviewed critically as space and facilities permit. Omission of more extended review, however, is not to be taken as criticism of the merit of the book.

Legal Medicine, Pathology and Toxicology. By Thomas A. Gonzales, Morgan Vance, Milton Helpern, and Charles J. Umberger. 2nd ed. New York, Appleton-Century-Crofts, Inc., 1954. Pp. 1349. Profusely illustrated.

Les Vomissements du Nourisson: Etude critique, Diagnostic ètiologique, Indications thérapeutiques. Par Emilio Roviralta. Edition revue et augmentèe par l'auteur en 1952. Adaptation frañçaise de Bernard Duhamel, d'après la traduction de Edouard Del Castillo Japuolot. Paris, Èditions Médicales Flammarion, 1952. Pp. 236. Illus.

Technique de la Chirurgie du Sympathique et de ses Infiltrations. Par O. Lambret, P. Razemon, et P. Decoulx. 4e èd. Paris, G. Doin & Cie, 1953. 115 figures et 4 planches.

Cystites Invétérées et Algies Pelviennes, leur Traitement par Infiltrations Anesthésiques et Neurotomies Chirurgicales. Par Raymond Darget et Rolland Ballanger. Paris, Masson & Cie, 1954. Pp. 118. Illus.

El Dranaje en Cirugía. Por Domingo Prat. Montevideo, Imprenta Rosgal, 1954. Pp. 166. Illus.

Aspectos Quirurgicos de la Estasis Biliar. Por J. Pi-Figueras, con V. Artigas y A. Llauradó. Madrid, Asociación Española de Cirujanos, n.d. Pp. 155. Illus. (III Congreso Nacional de Cirugía, Granada, Septiembre de 1953).

La Aortografía Abdominal. Por Ramon Carillo, Raul F. Metera, y Juan de Dulácska. Buenos Aires, Lopez & Etchogoyen, S.R.L., 1954. Pp. 114. Illus.

Sindromi Dolorose dopo Interventi Gastrici e loro Terapia Chirurgica. Per Luigi Leopoldo Bracca. Torino, Minerva Medica, 1952. Pp. 178. Plates.

Thorakoskopische Eingriffe am Nervensystem. Von E. Kux. Stuttgart, Georg Thieme, 1954. Pp. 130. 48 Teils mehrfarbigen Abbildungen.

Pratique de L'intubation intra-trachéale en Anesthésie. Par Henri Gibert. Paris, G. Doin & Cie, 1953. Pp. 188. 39 figures.

Pheochromocytoma and the General Practitioner. By Joseph L. DeCourcy and Cornelius B. DeCourcy. Cincinnati, DeCourcy Clinic, 1952. Pp. 165.

The Year Book of Obstetrics and Gynecology, 1954-1955. Ed. by J. P. Greenhill. Chicago, Year Book Publishers, 1954. Pp. 544. Abstracts.

Anuario Bibliografico Peruano de 1949-1950. Ed. by Alberto Tauro. Lima, Biblioteca Nacional, 1954. Pp. 427. (Ediciones de la Biblioteca Nacional-IX.)

A general bibliography. I. Books and pamphlets. II. Periodicals. III. Bio-bibliographies. IV. Bib. of librarianship. Fully indexed, with cumulative contents of the series.

Part I contains a section on medical sciences.

Hugh Roy Cullen, a story of American Opportunity. By Ed Kilman and Theon Wright. New York, Prentice-Hall, 1954. Pp. 376. Illus. Biography of a distinguished medical benefactor.

Diseases of the Skin, for Practitioners and Students. By George Clinton Andrews. 4th ed. Phil. and London, W. B. Saunders Co., 1954. Pp. 877. 777 illus.

La Valvola Mitrale: Aspetti anatomici, fisiologici, clinici e chirurgici. Per Michele A. Chiechi e Charles P. Pailey (sic). Roma, Pensiero Scientifico Ed., 1954. Pp. 561. Illus.

The History of the Samaritan Free Hospital, with an Appendix on the London Hospitals and infirmaries. By Arnold Whitaker Oxford. Cambridge, W. Heffer & Sons, Ltd., 1931. Pp. 96.

Patología del Estomago Operado: II Congreso Argentino de Gastroentoerología, Mar del Plata, 13-18 de Abril de 1953. Contributors from Sociedad de Gastroenterología de Buenos Aires, Asociación Argentina de Radiología, and Sociedad Médica de Mendoza. Buenos Aires, Ed. Universitaria, 1954. Pp. 482. Illus.

Verhandlungen der Deutschen Gesellschaft für Chirurgie, 70 Tagung, 7-11 April 1953. Berlin, Springer Verlag, 1953. Pp. 768.

BOOKS REVIEWED

Narben Bleiben Zurück (The Scars Remain). By Paul Rosenstein. Germany: Kindler and Schiermeyer, 1955. Pp. 316, with photographic illustrations.

This is the autobiography of one of the most eminent surgeons of Germany. Those who read German will derive a great deal of information and inspiration from its pages. The style is lucid, and the book represents a cross section of surgical practice in Germany at the apex of its activity and during its decline under the Hitler regime. The illustrations are photographs of contemporary scenes and personalities and are well executed.

In substance, the book depicts the hardships and indignities undergone by a surgeon, or any other person, of the Jewish faith, no matter how gifted, in a milieu of enforced prejudice and contracted vision.

Prof. Rosenstein was the first to introduce the urogram into surgical practice. He was assistant and later successor to the celebrated James Israel of Berlin and was sponsored by Von Eiselberg of Vienna. He introduced the urogram into surgical practice and was the first to point out the importance of serial sections to ascertain the route (ascending or descending) of renal infections. He recognizes with regret but without rancor that the American literature has never made adequate mention of his contributions to urology.

A vivid picture is presented of the bigotry prevalent even in the highest circles of medicine in Germany under Hitler, regardless of the eminence of its victims. He cites, as an example, the distinguished James Israel, whose name deterred the Medical Faculty of Berlin from according him a chair at the University. Very late in this great man's life the German Society of Surgery finally decided to make him an Honorary Fellow. Israel was the only Jewish scientist who received that distinction. What an indictment against the leaders of the time! Because of their religion, even the greatest men in medicine were kept in the background at congresses and learned forum discussions. When Prof. Rosenstein presented three new works, all on new themes, at the Congress of the German Surgical Society, the presiding officer (Körte) told him that he could not be permitted to deliver an address, but could be permitted a discussion or demonstration limited to five minutes!

There were one or two generous and tolerant spirits, of course. Sauerbruch, for example, had the courage to state to a class of medical students that James Israel had made great contributions to surgery. When the students showed resentment, Sauerbruch silenced them at once, saying, "Gentlemen, when all of you are forgotten, the name of James Israel will still illuminate the horizon of surgical achievement." To make such a remark in those days could condemn a man to a concentration camp; few indeed were those who dared to speak plainly.

During the Second World War it was Rosenstein who thought of ligating infected venous trunks to prevent general sepsis and embolism. He first described this method in the monumental work of Bier, Braun and Kümmel. He regrets that, thirty years later, some have spoken of this as a newly discovered method without mentioning the originator's name, and that America, which, he says, "stands at the head of scientific medicine today," should have overlooked this important contribution to surgical endeavor.

Prof. Rosenstein was also the first to perform a kidney transplant. The results were not satisfactory, but the idea was a spur to research in this direction. Again, he was the first to perform Eck's fistula procedure on a human being. One of Germany's great surgeons, August Dier, pointed this out at an open meeting: "While Eck's fistula has been proposed, it was Prof. Rosenstein who was the first to perform it successfully in a case of cirrhosis of the liver in a human being."

Although a general surgeon, Prof. Rosenstein was made an Honorary Member of the German Society of Urology in 1953.

The description of the terrific pressures and injustices perpetrated on those who did not agree with Hitler's dicta makes interesting reading. Rosenstein and other physicians, regardless of religion, who would not conform to Hitlerism were forbidden to treat Aryans. A very sick man was once brought to the hospital of which Rosenstein was chief surgeon. An operation was indicated to save the man's life. When Dr. Rosenstein recommended this procedure he was told that Mr. Goebbels would decide who should perform it.

After Prof. Rosenstein emigrated to England he became a British subject. He also spent some time in the United States, wandering about from one place to another, often without the means for food or lodging.

In New York his difficulties in trying to get a foothold were insurmountable. He managed to get unsalaried employment teaching topographic anatomy in the "First Institute of Podiatry." It was necessary that he learn English before taking the New York State Board examination. He mastered the language but was not admitted, and to this day he has been unable to discover why the opportunity to take the examination was denied him. Conditions in the United States were so painful to him that he left for Brazil, where he has been since 1935. At present he is engaged in research on the effect of bone marrow in malignant disease.

At one time Dr. Rosenstein and his entire family were destined for the gas chamber in Germany. This reviewer hopes that his historic book will be translated into English, so that those not conversant with German may get first-hand information concerning this period in Germany and its deterioration under the Hitler regime. As a scientist, Dr. Rosenstein naturally desired and expected the appreciation of the world, especially in his own country, of his sacrifices, devotion and contributions to our great calling. Instead, he had to flee from destruction in the country where some of his dear ones had perished.

MAX THOREK, M.D.

Chirurgie de la Main: Livre du Chirurgien. By Marc Iselin. Paris: G. Masson et Cie, 1955. 4th ed. Pp. 967, with 460 illustrations.

This volume comprises two separate books under one cover, by a pioneer in the field. The first of these is Surgery of the Hand: A Book for the Surgeon, of which this is the second edition, and Surgery of the Hand: A Book for the Practitioner, of which it is the fourth. The first of these has been entirely rewritten; it is a down-to-date version of the first edition, published six years ago. The second is a reprinting of the edition that appeared in 1945.

Despite the author's evident familiarity with the literature the integrated work has a distinctly personal savor. The reader is immediately struck with the individuality of his style, which tends toward the discursive, but with no loss of clarity. Considering the relative narrowness of its field, *Chirurgie de la Main* is a voluminous work, encyclopedic in its completeness.

In the *Book for the Surgeon* the bulk of the space is devoted to the diagnosis and surgical treatment of the sequelae of trauma and infection. Unusual attention is given to the psychologic and social implications. The divisions of this book are (1) Sequels of Traumatisms, (2) Acquired Affections and (3) Congenital Malformations. Under the first heading, comprising 465 pages, are the lesions classified by anatomic parts—the skin, bones, joints, tendons and nerves. In addition, chapters are included dealing with the sequelae of amputations, reconstruction of the thumb and fingers, and prostheses for the amputated hand. Under "Acquired Affections" are discussed *in extenso* Dupuytren's contracture (50 pages); tenosynovitis (30 pages); and arthritis deformans. There is also a chapter on tumors of the hand. The third and last section consists of some 25 pages devoted to the classification and treatment of congenital malformations, including syndactyly, congenital stricture of the fingers, camptodactyly, giant fingers, brachydactyly, agenesis and polydactyly.

The *Book for the Practitioner* deals with (1) wounds of the hands and fingers including foreign bodies and burns, and a discussion of the social aspects of trauma of the hands and its sequels; (2) infections, and (3) closed traumatisms of the hand and fingers, with well-chosen instructions for the management of fractures and dislocations. Finally, it contains a fourth part entitled "Evaluation of Incapacity," which will be especially interesting to doctors in industrial medicine.

The paper, the print and the binding leave nothing to be desired. The illustrations, photographic and schematic, are plenteous and effective.

Iselin's *Chirurgie de la Main,* 1955, is especially recommended among related works for inclusion in the libraries of practitioners handling much traumatic work, as well as those of surgeons with special leanings toward reconstructive surgery of the hand. It is an excellent work of reference for any physician.

ULYSSES GRANT DAILEY, M.D.

Hey Groves' Synopsis of Surgery. Edited by Cecil Wakeley. Baltimore: The Williams and Wilkins Company, 1951. 14th ed. Pp. 651; illustrated.

Practicing surgeons who cut their eye teeth on Groves will find in this latest edition the same compactness and at-a-glance order that has distinguished this standby for a half-

century. Medicine being what it is, a genuine epitome must be a continuing process, as alive as its users. The present offering has required many changes and additions: changes in the treatment of infections, resulting in part from the newer antibiotics, and definite advances in the surgical specialties, such as thoracic, plastic, urologic and vascular surgery. Careful revision has made room for these innovations and pruned the obsolete. There are also additional drawings.

The present edition will maintain Groves' reputation for dependability as a reference when the student is preparing for examination or the practitioner needs a thumbnail review of a particular treatment.

MAX THOREK, M.D.

Intestinal Obstructions. By Owen H. Wangensteen. Springfield, Ill.: Charles C Thomas, Publisher, 1955. Pp. 838, with 200 illustrations.

In the third edition of *Intestinal Obstructions* Dr. Wangensteen has written an outstanding book. Although basically the same as the two previous editions, the book is larger by 364 pages and 79 illustrations. It includes much of the new material that has been presented in the past fifteen years. The type has been reset completely in a style that makes for easy reading.

It is only such endeavors as these that will bring about a continuing decline in the mortality rate of intestinal obstruction. The references are numerous and all-inclusive. Of particular interest to this reviewer was the pithy presentation of Chapter 20, which deals with intestinal obstruction due to internal herina. The book can be recommended highly.

PHILIP THOREK, M.D.

Surgical Forum: Proceedings of the Forum Sessions, Fortieth Clinical Congress of the American College of Surgeons, Atlantic City, November 1954. Philadelphia: The W. B. Saunders Company, 1955. Pp. 835.

This book, with 384 contributors consists of the papers presented at the Forum Sessions of the American College of Surgeons.

Many excellent experimental studies are presented with reference to the stomach and pancreas, as well as a number of contributions on experimental studies in nutrition, body fluids and metabolism. In addition, the results of further studies on cancer are reported. The steroids, shock, burns and anesthetics as well are the subjects of many interesting reports, mostly experimental.

In addition to these papers, however, contributions on the heart and great blood vessels make interesting reading, calling one's attention to the important advances made in this area. Excision of thoracic and abdominal aneurysms and replacement with grafts apparently can be undertaken, with a reasonably low mortality rate. Various methods for sterilization of such grafts are presented by Szilazyi and his associates, and the discussions of the papers indicate that most surgeons have no hesitation in using plastic grafts for such replacements.

Included in this volume are studies of functional disturbances associated with certain cardiac disorders, such as the work of Ferguson and his associates on experimentally produced shunts of the patent ductus type; the study of Bowes and his associates on experimental abnormal pulmonary venous drainage, and the studies on valvular dysfunction by Meckstroth and Klassen, Himmelstein, Hurwitt, Hoffert and Ferreira. Other experimental operative procedures on the heart are described by Glenn and Turk and Shumway and Lewis, Albert and Warder, and De Wall and Varco, as probably clinically possible. Along the same line of endeavor, a number of reports are made on work done to develop a safe method for open operation on the cardiac chambers, including hypothermia and the use of controlled cross circulation.

Since it is a compilation of predominantly experimental and thought-provoking reports on a variety of subjects, this book will prove most interesting and worth while to those who wish to keep abreast of modern developments.

W. M. MCMILLAN, M.D.

Pathology for the Surgeon. By William Boyd, M.D. Philadelphia: The W. B. Saunders Company, 1955. Pp. 737, with 547 illustrations.

The seventh edition of this well-established work will take its place alongside the previous six editions. The book has been rewritten rather than revised. It should be noted that the title has been changed from *Surgical Pathology* to *Pathology for the Surgeon.*

Dr. Boyd's erudition and method of presentation are well known to surgeons in the United States. This text will remain a classic for many years to come. It can be recommended highly.

PHILIP THOREK, M.D.

Abstracts from Current Literature

L'éspace rétro-pubien (The Retro-Pubic Space). Carcasonne, M:, and Inglesakis, J. A., Marseille Chir. 202:6, 1954.

Anatomists and urologists do not agree as to the anatomic aspects of the retropubic space. The former insist on the presence of the venous plexus of Santorini; the latter affirm that they have never encountered it during retropubic prostatectomy.

The authors have carefully dissected 50 cadaver specimens and have studied numerous prostatectomies (Millin's retropubic operation) with a view to solving the riddle of the vascular plane.

The classic topographic picture of the retropubic space is reviewed. Surgically, this space is delimited in all directions except laterally. The space is divided into two layers, the vascular plexus of Santorini being situated in the inferior. The contents of the space are studied in detail: The pubovesical ligaments divide it into two compartments: 1. The superior compartment represents the cavity of Retzius and is, so to speak, empty. For the surgeon it represents a plane of cleavage and a route of approach to the inferior compartment. 2. The inferior compartment is bounded by the symphysis pubis anteriorly, the prostate posteriorly, the perineum inferiorly and the pubovesical ligaments superiorly. It constitutes the more important portion of the space and has prime surgical significance, particularly because of its vascular network.

The *arteries* of this lower compartment are of no importance. The *veins*, on the other hand, constitute a large plexus described as the preprostatic venous plane of Santorini. Theoretically this plexus would make it impossible to reach the anterior aspect of the prostate without extreme danger, but Millin's operation has proved the contrary. The present study tries to show how these contraindications can be reconciled.

Meticulous dissection has shown that there is a double plexus of veins, one superficial and one deeper, in front of the bladder and the prostate. The *superficial* plexus is not important. It is separated from the more significant *deep* plexus by an aponeurotic sheet. It represents the perineal confluence of large veins, and there is evidence that the superficial plane is its derivative collateral. This is a striking observation, and the classic descriptions of Santorini's plexus seem to correspond only to the superficial one. In reality, since the deep plexus is hidden by thick fibrous fascia (a continuation of the umbilicoprevesical aponeurosis), one can stop the dissection at this point and consider it a part of the anterior aspect of the prostatic bed.

The different fasciae are the key to the surgical planes of cleavage. Behind the umbilicoprevesicoprostatic fascia there is a second fibrous layer, which can be clearly isolated from the capsuloglandular plane of the prostate.

It is now easy to understand that when the surgeon approaches the prostate via the retropubic route, he pushes forward the plexus of Santorini, which is sandwiched between two aponeurotic fasciae. When one also considers that by enlargement (adenoma) the prostate pushes forward and separates laterally the two venous arcs of the deeper layer, one sees that they no longer stand in the surgeon's way, especially as they not only are not adherent to the prostate but are easily isolated. The anatomosurgical contradictions are, therefore, apparent rather than real. Thanks to this excellent study, the vascular problem of Millin's operation is solved, and new possibilities are opened for retropubic operations.

S. A. GUEUKDJIAN, M.D.

Prognosis of Breast Cancer for Pregnant and Nursing Women. White, T. T., Surg., Gynec. & Obst. 100:661, 1955.

After combing comprehensive statistics, the author concludes that there is a low incidence of mammary carcinoma complicated by pregnancy: 3 such carcinomas per 10,000 pregnancies, 2.8 per cent of all carcinomas of the breast, are associated with pregnancy.

The survival rate of women operated upon for carcinoma of the breast is generally agreed to be comparable to that of patients with un-

complicated mammary carcinoma.

The survival rate of women treated during pregnancy or nursing is comparable to that of women with uncomplicated mammary cancer if there are no metastases, but much worse if there is evidence of spread. A large number of the former group are cured.

Apparently there is more delay in therapy and therefore more advanced cases of carcinoma among pregnant or nursing women than among women in general.

No evidence can be found in the author's series to show benefit from therapeutic abortion.

WILLIAM E. NORTH, M.D.

Experimental Cardiac Surgery by Swan's Method of Rapid Cooling and Heating by Immersion (Chirurgie cardiaque expérimentale par la méthode de Swan-Refroidissement et réchauffement rapides par immersion). DuBost, C.; Nahas, G. G.; Espagno, G.; Esclavissat, M., and Schiessle, W., Presse Méd. 63:396, 1955.

Intracardiac surgery will make real progress only when interruption of circulation for longer periods becomes possible, leaving the heart temporarily exsanguinated. For a cardiac operation under direct vision it is necessary to clamp off the vena cava and the azygos. Under normal temperatures such an interruption is possible only for short periods, otherwise cerebral anoxia will ensue. Against this handicap and to make a longer interruption of the blood flow possible, two methods can be used: (a) the diversion of blood extracorporally or (b) diversion by artificial hypothermia.

Hypothermia can be induced either by drugs (Laborit's gangliоplegics, Cuhn's hydergine, etc.) or by physical means. The latter consists of simple refrigeration of the animal — or patient — after anesthesia has been induced. Refrigeration can be brought about *slowly*, reaching a temperature of 25 C. within one to three hours, or more *rapidly*, as advised by Swan and Juvenelle, by immersion of the body into water at 2 to 4 C. The temperature thus drops to 25 C. in about thirty minutes. Later the temperature can be raised to 37 C. within two hours, by rapid immersion of the refrigerated patient in hot water at 40 to 45 C.

Whatever the method used, two principal accidents are to be feared in cardiac surgery: insufficiency followed by cardiac arrest and especially ventricular fibrillation. The latter is the cause of about 50 per cent of deaths and the problem of fibrillation dominates the whole scene.

The authors give extensive details of 9 cardiac operations on dogs by Swan's method of rapid refrigeration and heating. Eight right ventriculotomies and 1 right auriculotomy were performed after clamping the azygocaval system from two to eighteen minutes. Seven dogs survived. Two died during the operation from irreversible ventricular fibrillation. Fibrillation appeared in 5 cases, in 3 of which it was controlled by a personal method of electric shock. Hydergine did not appear to have any appreciable effect on fibrillation.

The overall results are comparable to those obtained by other workers with the same method. The main advantage of the rapid cold-and-hot method lies in the fact that the period during which the body is subjected to sudden changes is short. The authors' impression is that this technic has given results better than those obtained by pharmacologically induced hypothermia.

This article is a very thorough study and presents justifiable hope, but it is rightly stressed that great reserve must be exercised in translating these experiments to surgery on the human being.

S. A. GUEUKDJIAN, M.D.

Obstructive Jaundice as a Complication of Peptic Ulcer. Schneider, E. M., and Hammarsten, J. F., Southern M. J. 48:374, 1955.

Obstructive jaundice as a complication of peptic ulceration of the stomach or duodenum is considered rare. That the syndrome may not be as rare as it seems but merely seldom diagnosed because of incomplete study was strikingly emphasized by 4 cases observed in less than eighteen months at the Oklahoma School of Medicine.

There are four possible mechanisms for the development of this picture: (1) obstruction of the common duct, due to fibrosis and periduodenitis; (2) occlusion of the common duct by a walled-off abscess; (3) erosion of the ulcer unto the common duct, with resultant cholangitis and ultimately biliary cirrhosis, and (4) edema of surrounding tissues, associated with acute progressive ulceration and involvement of the common duct.

Since treatment is surgical, despite the benign causation of the jaundice, it is imperative that both the physician and the surgeon be aware of these four possibilities.

The authors express their firm conviction that the occurrence of jaundice as a complication of peptic ulcer is not rare. The diagnosis is uncommon because it is rarely thought of, never sought and only occasionally found by accident.

A gastrointestinal roentgen series for every patient with obstructive jaundice and a serum bilirubin determination for every patient with peptic ulcer would undoubtedly increase the diagnostic incidence of the complication and provide the physician and the surgeon with valuable guides as to the patient's future management.

WILLIAM E. NORTH, M.D.

Four Cases of Serious Tetanus Treated by Curarization, Prolonged General Anesthesia and Positive-Pressure Intratracheal Pulmonary Ventilation. Lassen, H. C. A.; Bjorneboe, M.; Ibsen, B.; Neukrich, F., and Dollfus, P., Presse Méd. 62:1403, 1954.

During the poliomyelitis epidemic of 1952 in Copenhagen the authors learned that tracheotomy coupled with positive-pressure artificial respiration could keep many a patient with severe polio alive for several days. This led to their using the same technic in cases of severe tetanus, in which complete curarization is the only means of stopping convulsions.

The method consists of paralyzing the patient completely with curare, keeping him under continuous anesthesia with nitrous oxide and oxygen. Adequate pulmonary ventilation is maintained by positive-pressure artificial respiration (manual, with the breathing bag) via intratracheal intubation.

Four patients were thus treated. In 1, anesthesia was maintained continuously for seventeen days. Three are alive; the fourth died of myocarditis, granulopenia and septicemia after the symptoms of tetanus had subsided. The case histories are reported in detail.

Heretofore, patients died before lesions outside the nervous system had had time to appear. The authors point out that at present the complications of tetanus are not well understood. Myocarditis and granulopenia with thrombocytopenia were noted in 2 cases. Septicemia was another complication. The possibility that these "new" causes of death in cases of tetanus are due to some allergic reaction to the drugs administered in large doses cannot be overlooked. The pathologic problems are commented upon.

S. A. GUEUKDJIAN, M.D.

Radical Surgery in Cancer of the Cervix Metastasized to Peripheral Lymph Nodes. Brunschwig, A., Surg., Gynec. & Obst. 100: 575, 1955.

Dr. Brunschwig presents the record of a series of 56 patients, subjected to radical hysterectomy and pelvic lymph node excision three or more years prior to the time of writing, in whom pathologic study of the peripheral pelvic lymph nodes revealed the presence of metastases. Of these 56 patients, 24 (43 per cent) survived three or more years after the operation. Twenty-nine were operated upon five years earlier; of these, 9 were well at the end of the five-year period, an incidence of 31 per cent.

It has been suggested that by radical hysterectomy and pelvic lymph node excision a not inconsequential number of patients (31 per cent) may be salvaged for at least five years. Because of inability to detect peripheral pelvic node metastases by clinical (pelvic) examination, the efficacy of radiologic treatment in their control cannot be evaluated for comparison. This fact might be presented as an argument favoring radical operation as the best method of primary treatment.

EDMUND LISSACK, M.D.

The Functional Menometrorrhagias: The Value of Cytohormonal Biopsy as a Guide to Treatment. Based on 131 Cases (Les ménométrorragies fonctionnlesses; à propos de 131 observations. Valeur de la biopsis cytohormonale comme guide du traitement). Mathieu, J., and Villedieu, P., Presse Méd. 63:404, 1955.

Functional uterine bleeding is a therapeutic headache.

When a woman complains of blood loss *per vaginam*, either as long or heavy periods with a normal rhythm, as frequent irregular periods, as abundant periods with intermenstrual loss or as metrorrhagia without any cyclic character, the doctor, in the absence of positive physical signs, diagnoses functional menometrorrhagia. He then starts a variety of treatments, according to his outlook and ability.

A study of 131 cases of functional uterine bleeding is presented. Of these 131, 20 underwent hysterectomy; 22 were subjected to hysterographic study, with normal pictures in 18, and cytohormonal biopsies were performed in 89.

In the 89 cases, according to the histologic data, medical treatment was instituted, but only 45 patients were cured; 31 did not respond at all, and in 13 the results were inconclusive. It is therefore suggested that cytohormonal biopsy is not a reliable guide to the treatment of functional menometrorrhagia.

S. A. GUEUKDJIAN, M.D.

Extravasion of Bile After Operations on the Biliary Tract. McKenzie, G., Australian and New Zealand J. Surg. 24:181, 1955.

After operations on the biliary tract, any abdominal abnormality, whether of acute or of insidious onset, should suggest the possibility of leakage of either blood or bile from the site of operation.

Twenty cases are presented in two categories: (1) cases of acute onset with shock within forty-eight hours and (2) cases of subacute or insidious onset in the course of four days to four weeks after the operation.

Acute.—Severe shock was the outstanding feature and occurred in all cases. It developed within forty-eight hours of the operation. In only 1 case was there severe generalized abdominal pain. Abdominal signs were indefinite. Rigidity was noted in only 1 patient. Tenderness was marked in this case, but in the others it was not a prominent feature. Mild distention of the abdomen was noted in some cases.

Subacute.—No signs of shock were observed in any of the 13 patients in this group. One of the most striking features was the period during which the bile collection must have been present without symptoms. Abdominal pain was recorded in more than half the cases. The onset was usually sudden, but the severity was variable. It was usually of short duration; in these patients who were not subjected to laparotomy the pain subsided within a few hours. However, further attacks occurred, and some patients did not complain of pain. Vomiting occurred occasionally and should not be disregarded at this stage. Some degree of abdominal distention was observed in all patients. Mild jaundice developed in 4 patients who had not been jaundiced before the original operation. In 7 patients with collected bile in the peritoneal cavity did not develop jaundice at any stage. Tachycardia was noted in the majority, and in several it was found there had been persistent tachycardia from the time of operation. Thoracic signs often make the surgeon suspect pulmonary lesions.

Diagnosis. — In these cases delay in diagnosis was common. Not unexpectedly, the delay occurred mainly with the insidious type; in some of these patients the diagnosis was not made during life.

In cases of the acute type, in which peripheral circulatory failure develops in the first forty-eight hours after operation, a diagnosis of reactionary hemorrhage or of bile extravasation should be immediately considered. Laparotomy should be undertaken if possible, with suitable resuscitative measures. But it is important to realize that such a dramatic onset occurs in less than half of the patients who have postoperative leakage of bile. An early diagnosis in all cases will be made only if it is realized that the symptoms and signs may be mild and fleeting in the early stages. Pain, even though mild and of short duration, should arouse suspicion. Unexplained tachycardia or the occurrence of vomiting and distention several days after the operation may be due to an intraperitoneal collection of bile. A drainage tube from which there has been no outflow at all has almost certainly been blocked by blood clot or an omental plug from the beginning and therefore fails to indicate the accumulation. More significant still, a copious discharge of bile, ceasing suddenly before or after removal of the tube, shows that an abnormal exit from the biliary tract exists. Any abdominal symptoms and signs in such a case would constitute strong evidence of an intraperitoneal collection.

Roentgen examination of the right hemidiaphragm may help in diagnosis, and *paracentesis abdominis,* also, but the latter has limited use.

Treatment.—Prevention of bile extravasation obviously depends on meticulous adherence to well-known principles in the technic of cholecystectomy and choledochostomy. The cause of leakage in those cases of this series in which it is known emphasizes the need for secure ligation of the cystic duct, proper oversewing of the gallbladder bed, and careful closure of any incision in the common bile duct. Drainage of the common duct is obligatory if it is opened in the presence of obstruction, and this has been shown to apply even when the opening consists only of needle puncture of the duct.

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